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WITH A

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TABLE OF CONTENTS

ARTHUR W. KORNHAUSER. Results from a Quantitative Questionnaire on Likes and Dislikes Used with a Group of College Freshmen 85

RICHARD S. UHRBROCK AND JUNE E. DOWNEY. A Non-Verbal Will-Temperament Test 95

HARVEY C. LEHMAN AND PAUL A. WITTY. Periodicity and Growth 106

N. F. STUMP. A Class-Room Experiment in Logical Learning. 117

EDNA J. FOX. The Diagnostic Value of Group Tests as Determined by the Qualitative Differences Between Normal and Feeble-Minded Children 127

H. K. NIXON. A Study of Perception of Advertisements..... 135

J. E. W. WALLIN. A Further Note on Scattering in the Binet Scale 143

J. E. BATHURST. A Partial Correlation Schema 155

NOTES AND NEWS 165

BOOK REVIEWS..... 169

NEW BOOKS AND PAMPHLETS RECEIVED..... 178

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RESULTS FROM A QUANTITATIVE QUESTIONNAIRE ON LIKES AND DISLIKES USED WITH A GROUP OF COLLEGE FRESHMEN

ARTHUR W. KORNHAUSER

University of Chicago

A questionnaire very similar to the ones used by Freyd[1] was given to 110 freshmen in the School of Commerce and Administration of the University of Chicago in 1923.

The student indicated his feeling toward each of the 164 items in the list by encircling one of the five symbols placed beside each item. The symbols are:

L!—"if you like the item very much"
L—"if you like the item"
?—"if you have no decided feelings toward the item"
D—"if you dislike the item"
D!—"if you dislike the item very much"

The summary on pages 86 to 90 shows the distribution of responses for each item. The items marked with an "x" are the ones that showed fairly clear differences between good and poor students. The 30 items marked "xx" are the ones which gave the best differentiation.

The procedure used in evaluating the single items was as follows: The questionnaires were sorted into three groups according to the average first year marks of the students—the 25 per cent with highest marks, the 25 per cent with lowest marks and the 50 per cent intermediate. From each of these three sets, 15 typical questionnaires were taken as a sample. Then a tabulation was made showing, for each item on the

[1] Dr. Max Freyd: A method for the study of vocational interests. Journal of Applied Psychology, September, 1922; The measurement of interests in vocational selection. Journal of Personnel Research, October–November, 1922.

SUMMARY OF RESPONSES TO QUESTIONNAIRE ON LIKES AND DISLIKES

			L!	L	?	D	D!
xx	1	Scientific people	*12*	*69*	26	1	1
xx	2	Artistic people	18	*48*	*33*	*10*	*1*
x	3	Self-confident people	*20*	*33*	*15*	*28*	14
x	4	Impulsive people	7	26	*38*	*29*	*7*
	5	Energetic people	57	49	2		2
	6	Absent-minded people	1	5	25	38	35
	7	People who disagree with you	2	38	41	23	4
xx	8	People more intelligent than you	42	*52*	*13*	*3*	*1*
x	9	People less intelligent than you	9	*35*	*48*	*14*	*3*
	10	Optimists	35	25	5	3	3*
xx	11	Pessimists	*5*	*11*	*8*	*32*	53
	12	Foreigners	1	31	45	24	8
	13	People who tend to assume leadership	12	50	27	17	3
	14	People who are easily lead	5	17	27	46	15
	15	Progressive people	43	60	4	1	
x	16	Conservative people	9	*49*	*26*	*20*	*1*
	17	Forgetful people	1	4	27	53	21
	18	People who are slow in making decisions	5	19	46	27	11
x	19	Students who work for grades	16	*35*	*28*	*21*	*10*
xx	20	Students who bluff		*4*	*13*	48	45
	21	Students who cheat	1		*4*	20	84
xx	22	Teachers who are "easy"	*3*	*28*	*42*	27	10
	23	Teachers who are strict	13	59	26	10	2
x	24	Teachers who give sermons	3	17	21	*49*	*20*
x	25	Teachers who are bookish	*1*	*7*	*22*	*58*	23
xx	26	Old teachers	*11*	*40*	42	12	4
	27	Young teachers	18	55	29	7	1
	28	Men teachers	36	54	19		
	29	Women teachers	8	42	32	17	8
	30	Jealous people		6	9	51	42
	31	Conceited people	2	2	2	33	71
x	32	Emotional people	*4*	*33*	*43*	*21*	7
xx	33	Talkative people	*4*	*25*	30	37	12
xx	34	Religious people	13	*47*	*36*	*9*	*4*
	35	Irreligious people		8	52	32	17

* The symbols after this item were omitted by mistake in the original questionnaire. This fact explains the small number of responses recorded.

SUMMARY—*Continued*

			L!	L	?	D	D!
	36	Successful people	50	51	7	2	
x	37	People who are failures	3	18	54	23	*10*
	38	Witty people	37	59	8	3	
x	39	Highly educated people	55	*46*	*5*		*3*
xx	40	Immoral people	*1*	*2*	*12*	*34*	68
x	41	Cautious people	13	51	24	*17*	*3*
	42	People who have no sense of humor	5	3	19	43	38
x	43	Nervous people		*5*	*40*	52	11
x	44	People who always agree with you	*2*	*12*	*22*	*54*	17
	45	People who talk about themselves		1	10	48	50
	46	Methodical people	8	37	39	15	2
xx	47	People who have radical views	*3*	*15*	*37*	*42*	11
	48	People who are very studious	9	*42*	*32*	*22*	*2*
x	49	Stupid people	*1*	*5*	*19*	*63*	20
	50	Comic strips	18	64	16	5	3
	51	Popular songs	30	63	9	4	1
x x	52	Educational movies	24	55	16	*11*	*2*
xx	53	Travel movies	21	*60*	*13*	*12*	*2*
	54	Vaudeville	22	55	13	12	3
x	55	Musical comedy	44	48	*12*	*1*	*2*
xx	56	Grand opera	29	37	*23*	*12*	*7*
x	57	Concerts	22	*50*	*15*	*20*	*3*
	58	Listening to a story	15	58	26	8	1
xx	59	Telling a story	*4*	*35*	*18*	37	9
x	60	College classes for men only	12	27	34	27	*7*
	61	College classes for men and girls	13	57	28	9	2
	62	Class discussions	46	53	9	1	
	63	Written examinations	5	37	21	31	15
x	64	Oral quizzes	*17*	48	21	18	5
	65	Definite study assignments	39	58	3	6	2
	66	Indefinite assignments of topics for study	7	11	16	44	30
x	67	Psychological tests	*12*	*43*	*25*	25	14
x	68	Questionnaires like this	10	39	27	*10*	*13*
x	69	Writing long reports	4	10	18	55	*22*
	70	Golf	26	26	48	6	3
	71	Fishing	20	52	22	11	4
x	72	Professional baseball	15	38	*34*	*10*	*10*
	73	Playing baseball	33	44	18	8	5

SUMMARY—*Continued*

			L!	L	?	D	D!
xx	74	Tennis	40	35	*25*	*6*	*2*
x	75	Swimming	50	*37*	*18*	*4*	
xx	76	Football	57	*38*	*9*	*1*	*2*
	77	Driving an auto	55	33	19	1	
xx	78	Taking long walks	35	*50*	*14*	*10*	*1*
x	79	Checkers	10	*28*	*41*	*22*	*8*
xx	80	Poker	*9*	29	30	18	18
x	81	Solitaire	*4*	*29*	*36*	*22*	16
	82	Billiards	17	42	27	14	5
xx	83	Dancing	41	*39*	*19*	*4*	*6*
xx	84	Summer resorts	*36*	*48*	14	7	1
	85	Amusement parks	9	47	25	25	4
xx	86	Smokers	*14*	*31*	39	9	11
x	87	Intercollegiate athletics	*57*	*38*	13	1	
	88	Fraternities	32	34	37	1	2
	89	Reading	44	50	7	6	1
x	90	Vacations from school	*37*	*49*	17	5	
	91	Collecting stamps or coins	9	23	47	26	12
	92	Collecting natural science specimens	12	7	47	34	15
	93	Collecting books	10	37	34	21	5
	94	Experimenting with electricity	13	28	36	22	6
x	95	Experimenting with chemistry	*11*	*29*	*41*	16	8
x	96	Working with machinery	*21*	*47*	*22*	12	5
	97	Photography	6	36	47	15	3
	98	Music	44	32	17	7	5
x	99	Detective stories	17	46	18	*21*	*7*
xx	100	Love stories	*9*	*58*	17	16	10
	101	Sporting pages	52	46	10	1	
x	102	Being the butt of a joke		*17*	47	28	13
	103	Arguing	28	64	11	12	*3*
	104	Interviews	9	38	37	18	5
	105	Making a speech before a crowd	5	26	15	35	27
x	106	Opening a conversation with a stranger	*8*	*36*	*33*	*24*	7
xx	107	Being left to yourself	*6*	*33*	*26*	*31*	12
	108	Teaching	8	22	36	31	11
x	109	Living in the city	*30*	63	6	*5*	4
x	110	Living in the country	21	32	23	*24*	*9*

SUMMARY—*Continued*

			L!	L	?	D	D!
	111	Mathematics	35	36	7	14	6
xx	112	Physics	*15*	*41*	28	14	7
	113	Chemistry	19	28	29	20	7
	114	Physiology	10	34	43	14	2
x	115	Manual training	13	37	33	*16*	*4*
	116	Mechanical drawing	16	27	31	21	7
x	117	Freehand drawing	12	31	*25*	*27*	*13*
x	118	Ancient languages	*4*	*15*	*23*	34	30
	119	Modern languages	19	52	14	14	8
	120	English composition	7	57	22	19	3
	121	Spelling	24	47	24	12	1
	122	History	36	48	6	15	3
x	123	Civics	38	*50*	*12*	*3*	*1*
	124	Economics	42	57	4	3	2
xx	125	Commercial subjects	50	*43*	*13*	*1*	*1*
	126	Public speaking	21	26	27	24	8
x	127	Sociology	12	*31*	*54*	*2*	
	128	English literature	19	43	28	17	
	129	Pacifists	4	18	40	23	11
x	130	Trade unions	8	35	*40*	*16*	*8*
	131	Strikes	1	6	27	43	31
x	132	Wars	*1*	*12*	*19*	*32*	44
	133	Armies	4	34	34	25	10
x	134	Republicans	*20*	*39*	42	6	
x	135	Democrats	*5*	*20*	*52*	*22*	7
	136	Socialists	1	17	42	21	20
	137	Communists	4	8	33	33	30
	138	I. W. W.	5	6	16	27	57
	139	Ku Klux Klan	8	19	26	17	36
x	140	Negroes	11	22	*40*	*20*	*17*
xx	141	Jews	22	*23*	*27*	*20*	*13*
xx	142	Catholics	14	40	*35*	*14*	*8*
x	143	Protestants	25	56	*26*	*4*	
x	144	Irishmen	7	55	*32*	*9*	*3*
x	145	Englishmen	8	*56*	*29*	*8*	*6*
x	146	Frenchmen	5	46	*41*	*9*	*7*
x	147	Germans	4	*44*	*39*	*9*	*10*
	148	Chinese	2	16	46	31	12
x	149	Japanese	9	15	46	*30*	*9*

SUMMARY—*Concluded*

			L!	L	?	D	D!
	150	Literary Digest	31	57	14	9	2
x	151	Life	*17*	55	16	9	4
	152	New Republic	7	23	55	11	5
x	153	System	6	*28*	*43*	*10*	*11*
	154	Nation	13	31	48	5	6
x	155	Saturday Evening Post	25	*46*	*20*	*10*	*5*
	156	Atlantic Monthly	11	43	40	8	4
x	157	Collier's Weekly	*4*	*37*	*44*	19	3
x	158	World's Work	12	44	*44*	*5*	
x	159	Outlook	21	*47*	*38*	*8*	
	160	Independent	7	32	48	6	6
xx	161	American Magazine	37	44	*22*	*6*	
x	162	National Geographic Magazine	*54*	*39*	27	4	3
x	163	Popular Mechanics	*24*	*50*	25	9	
x	164	Scientific Monthly	*19*	*49*	28	10	1

questionnaire, the number of L!'s encircled by the high medium and low groups respectively, the number of L's encircled, and so on for the other symbols. Comparisons were next made for each item to see how great the differences were from group to group in the percentages checking the symbol or combination of symbols which gave the best differentiation. More specifically, the percentage of the low group who encircled a symbol, say L!, was obtained; the percentage of the high and medium groups combined who checked the L! was similarly figured (the medium group was given double weight since it represented twice as many cases); then the difference between these two percentages was taken and the standard error of the difference was calculated. The size of the difference, with due regard to the size of the standard error, indicates the excellence of differentiation between the students with low marks and all other students. A parallel procedure was followed to ascertain how well each question differentiated between the high group and all other students. The questions which are checked on the list were selected on the basis of their value in differentiating both the low and the high students.

An example will serve to illustrate the method. Item 112 (one of the best differentiating) was marked as follows by the three groups of students:

	L!	L	?	D	D!
High students	4	10	1	0	0
Medium students	3	3	8	1	0
Low students	2	4	6	2	1

The best differentiation is secured by taking the percentage who marked L! or L. In the case of the differentiation of the high students from the other, the percentages are

Per cent of high group who marked L! or L..... 93
Per cent of low and medium groups who marked L! or L..... 40

The difference is 0.53. The standard error of the difference is obtained from the formula[2]

$$E^2_{12} = \frac{P_1Q_1}{N_1} + \frac{P_2Q_2}{N_2}$$

where P_1 is the per cent of one group giving the answer, Q_1 the per cent of this group not giving the answer, P_2 the per cent of the other group giving the answer, and Q_2 the per cent of that group not giving the answer. N_1 and N_2 are the numbers of individuals in the two groups respectively. The standard error in the present instance is 0.097. It becomes clear, then, that this item shows a large and significant difference between high students and others.

The same item considered with respect to the differentiation of the low group from the others gives results as follows:

Per cent of low group who marked L! or L..... 40
Per cent of high and medium groups (medium given double weight) who marked L! or L..... 58

[2] Yule: Introduction to the Theory of Statistics, p. 269. Freyd: The measurement of interests in vocational selection. Journal of Personnel Research, October–November, 1922.

The difference is 0.18; the standard error is 0.146—a somewhat uncertain differentiation. Even so, there is a fair probability of some difference occurring. The item is certainly one to be retained in view of its excellence in marking off the high students.

Each of the 164 items of the questionnaire was evaluated in this way and then selected or rejected on the basis of the extent and certainty of the percentage differences. For each checked item in the list, the symbol or combination of symbols which gave the best differentiation is indicated by the numbers in italics. These symbols are, at the same time, the ones which receive credit if we are scoring the questionnaires with a view to selecting the more capable students. Thus item 1 gave good differentiation (it is checked); the differentiation is best if we take the marking of L! and L (they are italicized); and finally, if we are scoring a questionnaire we should give credit (say, a score of+1) for the encircling of L! or L.

The 108 students who filled in the questionnaire completely were given scores on the 30 double-checked items—a credit of one point being allowed for each item marked in the specified way. The scores ranged from 7 to 26. The correlation between these scores and average first year marks was 0.52—a coefficient of about the same size as those obtained with intelligence tests. (The correlation between the questionnaire scores and the Otis intelligence test was 0.29). There is, however, a more serious question of reliability in the case of the questionnaire score. Evidence of the serious lack of reliability is disclosed by a comparison of the correlation coefficients for two different groups. For the 45 people who were used in our sample groups, the correlation between questionnaire score and first year marks was 0.73; the corresponding relationship for the other 63 students of the 1923 class was 0.17. The coefficient of 0.73 is in a sense fictitious, since the items were deliberately chosen in a manner to make this correlation as close as possible. The fact that the correlation is only 0.17 for the remaining members of the same general group indicates that the method gives results so inconsistent and unstable as to be of little value.

The unreliability of the questionnaire results became further apparent through the following comparison. In order to check the results obtained from our sample of 45 questionnaires, another sample of 30 (10 high, 10 medium and 10 low) was taken. Of the 30 questions which gave the best differentiation in the first sample, only eight gave even fairly good results in the new sample. The correlation of total scores on the 30 items, with average marks, was 0.20 in this group of 30 people, as contrasted with the 0.73 in the original sample.[3]

The conclusion appears amply justified that the questionnaire gave results so unreliable that no use can be made of it in predicting the collegiate work of students.[4]

Certain special tendencies in the marking of the questionnaire were studied to see whether significant relations might be found in directions other than those we have been discussing. Some slight differences appear between good and poor students in the total number of each symbol marked. The figures are (in percentages):

	L!	L	?	D	D!
High students	15.1	35.2	27.8	14.5	7.4
Medium students	15.7	30.0	27.6	15.7	11.0
Low students	18.4	35.0	26.9	13.4	10.2

The correlation between first year scholarship and total number of L!'s and D!'s encircled for all 108 students is -0.22. This

[3] We have recently analyzed the results from the same questionnaire used with the 1924–1925 freshman class. Obviously the questionnaire has little value as a predictive device if the questions which are significant one year are not usable the next year. The correlation between first quarter marks and scores on the 30 questionnaire items for this new group is 0.16. Only eight of the questions were at all diagnostic—and only two of these were items which differentiated in both samples of the preceding year.

[4] Similar lack of consistency and stability in questionnaire results has been reported by Craig in work done with retail saleswomen (The preference-interest questionnaire in selecting retail saleswomen. Journal of Personnel Research, February–March, 1925.) Freyd has not reported any check on the reliability of his results.

is at least suggestive of greater moderation on the part of the higher students, but its practical usefulness and stability are doubtful.[5] In certain groups of items the tendency is striking. For example on items 140 to 149 inclusive (religions and nationalities), the high group had a total of 9 markings of L!, the medium group had 12, the low group had 31 (in the original sample of 45 cases). Even this relation, however, is of doubtful reliability. In the second sample (30 individuals), the numbers checking L! were 3, 10, and 11. This is only slightly in the direction of the other figures.[6]

Aside from the very doubtful relationships of the foregoing kind, the questionnaires may nevertheless throw significant light on the characteristics of the individual student. The value of knowledge concerning special individual likes and dislikes cannot well be demonstrated but is none the less important. Analysis of exceptional likes and dislikes or of exceptionally large numbers of extreme reactions is apt to be particularly revealing. A few students have over half their items marked in the extremes, while a few others have only five or ten of the 164 items so marked. In individual items the exceptions are even more apparent—as can be judged from the distributions given in the list on pages 86 to 90.

The results are likewise of considerable interest as indicators of student opinion or attitude. Group tendencies are certainly more reliably revealed than are individual peculiarities. The nature of the group reactions can be seen in the summary figures given in earlier pages.

[5] A later study of results in 1924–1925 reveals a slight tendency in the opposite direction. Evidently the relationship is more or less a chance one.

[6] In 1924–1925 the relation is reversed. The figures are: high, 29; medium, 24; low, 15.

A NON-VERBAL WILL-TEMPERAMENT TEST

RICHARD S. UHRBROCK AND JUNE E. DOWNEY

University of Wyoming

The Downey Group Will-Temperament Test has two distinct limitations. Its usefulness is limited to the literate group, and it probably cannot be given with any great degree of success below the fifth grade. When the National Research Council, through its Committee on Migrations Research, made it possible to investigate the Will-Temperament Tests, it was suggested that a Non-Verbal Will-Temperament Test might be produced for use in studying racial differences. During 1925 a form was devised with that end in view. The present account is in the nature of a preliminary report on the research attempted.

The Non-Verbal Will-Temperament Test consists of thirteen parts, called for convenience by the following names: (*a*) Speed of Decision, (*b*) Speed of Movement, (*c*) Ability to Speed, (*d*) Ratio, (Ability to Speed ÷ Speed of Movement), (*e*) Ability to Hold Back, (*f*) Eye-Hand Coordination, (*g*) Interest in Detail, (*h*) Persistence, (*i*) Expansiveness, (*j*) Drive, (*k*) Self-Confidence, (*l*) Reaction to Suggestion, and (*m*) Sticking to Decisions.

It was the original intention of the authors to devise non-verbal material that would induce the same mental sets obtained in the case of the verbal form of the Will-Temperament Tests. An analysis of the correlations between the tests bearing the same names in the verbal and non-verbal forms indicates that identical mental sets were not induced. Whether or not this defect is inherent in the material, we are unable to say.

The preliminary directions for the Non-Verbal Will-Tempera-

ment Test state the general method involved in the program. The directions are as follows:

> The *Non-Verbal Will-Temperament Test* is different from any test you ever have taken. It is arranged to measure the traits, or abilities, that may help you in being a success in school, and in the work you do after you leave school. In actual life, sometimes, you are expected to work steadily, at a regular or natural speed. Sometimes you are required to "speed-up" and work just as rapidly as possible. At other times, you need to hold back—to go as slowly as possible. In some parts of the *Non-Verbal Will-Temperament Test* you will be required to work at your natural speed; in other parts you will be asked to work just as rapidly as possible. Sometimes you will be told to go very, very slowly. Listen to the directions carefully. Begin promptly when you are told to begin. Work exactly as you are directed. Stop immediately when you are told to stop. Turn the page to Test I.

In Test I, "Speed of Decision" is measured by the reaction of the subject to thirty-six sets of paired designs. The directions are given as follows:

> Notice the pairs of pictures. In each pair select the one picture you like the better. Put a cross (×) in the space under that picture. Put a cross under one or the other picture in each pair.

The test is scored on the basis of the total number of designs checked in thirty seconds.

"Speed of Movement" and "Ability to Speed" are measured in Tests II-A and II-B. In Test II-A there are two sets of horizontal lines, 16.5 cm. long and 8 mm. wide. At the beginning of the first pair of horizontal lines there are five slanting lines, followed by a small arrow. The directions for this part of the test read as follows:

> Notice the slanting lines between the two long lines. Also, notice the arrow. When I say "Start," but not before, begin at the arrow and draw slanting lines until I say "Stop." Work at your natural speed. Ready. Start.

The upper and lower horizontal lines tended to restrict the free movements of the subjects. This may explain, partially, the fact that this test does not correlate with the "Speed of

Movement" test in the verbal form of the Will-Temperament Test in which the subjects write the phrase "United States of America" without restriction.

The make-up of Test II-B, designed to measure "Ability to Speed," is similar to that described above for Test II-A, with the exception that there are three sets of parallel lines instead of two. The directions are as follows:

> This time you are expected to work *just as fast as you possibly can.* When I say "Go," but not before, draw as many slanting lines as you can in the time allowed. Work rapidly. Ready. Go! Fast!

Both "Speed of Movement" and "Ability to Speed" are scored on the basis of the total number of slanting lines made. In each case the time allowed is twenty seconds.

The purpose of obtaining the ratio between the "Ability to Speed" and "Speed of Movement" is to secure a measure comparable with that entitled "Freedom from Load" in the verbal form of the test. "Freedom from Load" has been defined in the following terms:

> Consider whether the individual maintains speed without external pressure or effort. Take into account "friction" or "tension" that may prevent him from working at top speed. If this is absent, he is "free from load."

Test III, which has been called "Ability to Hold Back," is designed to measure the trait termed "Motor Inhibition" in the verbal form of the Will-Temperament Test. The Non-Verbal test form consists of three parts, composed of dotted lines. The directions for Part A read as follows:

> This time you are expected to work *just as slowly as you possibly can.* When I say "Begin," but not before, start tracing the dotted outline. Keep the pencil moving, but go as slowly as you possibly can. Trace the lines, but remember to work very, very slowly. Ready. Begin.

The directions for Part B read,

> Try again. *Work more slowly,* but keep the pencil moving. Ready. Begin.

The direction for Part C read,

Try once more. *Go just as slowly as you possibly can.* Ready. Begin.

The time for Part A is one minute; for Part B one and one-half minutes. These are practice forms, and are not scored. The time for Part C is two and one-half minutes. The test is scored on the basis of the total number of dots traced. The fewer dots traced, the higher the rating of the subject in this trait. In order to determine the correct standing of the subject, the scores for the entire group should be translated into percentile rank, giving the ranking of 99 per cent to the one who has shown the greatest "ability to hold back," and the ranking of 1 per cent to the individual who traced the greatest number of dots.

Test IV corresponds to the "Memory Test" in the verbal form. It is introduced at this point for use later in the tests for "Self-Confidence" and "Reaction to Suggestion." While the subjects are engaged in tracing the dots in the previous test, a five by eight inch booklet is quietly placed on the desks. At the completion of Test III, instructions are given as follows:

A book like this one [examiner shows book to group] has been placed on your desk. Do not open it until you are told to do so. The book contains some pictures, printed one on a page. We are going to look at each picture for five seconds. Be ready to turn the page when time is called. Spend the entire five seconds looking at the picture. Ready. Turn the first page.

The examiner says, "Turn the page" at five-second intervals. The booklet contains twenty pictures which are 5 by 3.5 cm. in size. All represent single figures which are printed in black. There are ten pictures for each of the sexes. The examiner purposely avoids saying anything about the number of pictures as this would interfere with the later tests. Few children note the exact number.

After the subjects have inspected the pictures the examiner says,

Now set the book aside. We shall come back to this part of the test later.

Before the tests for "Self-Confidence" and "Reaction to Suggestion" are reached, the booklets are collected quietly.

Test V, "Eye-Hand Coordination," contains two vertical lines, 8 cm. long and 16.5 cm. apart. The left hand line is lettered "A;" the other "B." Two centimeters to the left of Line B, at the top there is an arrow, lettered "C." Lines A and B contain short cross lines 8 mm. apart. The directions for Test V read as follows:

Look at the two lines, A and B. Also, notice the crosses on the lines. Find the Arrow C. When I say "Go," but not before, draw straight lines, *just as fast as you can*, from the crosses on Line A, in the direction of the crosses on Line B, *but stop directly under the Arrow C*. Work as fast as you can, and draw as many lines as you can in the time allowed. Remember to draw the lines from A, toward B, but stop directly under the Arrow C. Ready. Go! Fast!

The time allowed for Test V is fifteen seconds. The following method of scoring has been utilized. A line is dropped from the Arrow C, parallel to Line B. The total deviations from this line, measured in millimeters, constitutes the final score. Plus and minus discrepancies are ignored. As in Test III, this final score must be translated into percentile rank, and inverted, to place the subject properly. It is assumed that the individual who deviates least should be ranked highest in "Eye-Hand Coordination," and vice versa. This test is wholly unlike the test for "Coordination of Impulses" in the verbal form, and must not be confused with it.

Test VI, designed to measure "Interest in Detail," will be described, although no satisfactory scoring method has been devised, and the results from the tests have not been used in any comparisons. The test consists of nine lines of dots. The first line contains ten dots; the last one contains seventy-eight dots. Above each line, directions similar to the following are printed, "Divide the dotted line below into two equal parts," "Divide the dotted line below into nine equal parts," etc.

Five minutes are allowed for this test. In looking over the first sets of papers after this test was given it was very evident that some subjects carefully counted the dots, and used this count in sub-dividing the lines. Other subjects divided the lines entirely on the basis of inspection. A few start counting and then change to the inspection method. After the test was completed, later groups were asked to indicate the method they employed. The results, however, have not been analyzed.

Test VIII, designed to measure "Persistence," represents an attempt to duplicate Test VIII-2. "Volitional Perseveration," in the verbal form. The directions for the Non-Verbal "Persistence" test read as follows:

> Look at the design below. Make as many designs as *unlike* the one below as possible. Practice as long as you wish. Speed does not count. Don't erase any lines. Work until you are entirely satisfied that you have produced a design that is *totally* different. Then copy the one that is most unlike in the square in the lower right hand corner of this page. When you have finished, look up and note the first number that appears on the blackboard. Put that number in the small square in the corner of the large one which contains your finished design. Ready. Begin.

While the subjects are working, the examiner indicates the time in five second intervals on the blackboard. A total of five minutes is allowed. The test is scored on the basis of the total time spent in working out the "unlike" design.

Test VIII-A is designed to measure "Expansiveness" which has been defined as follows:

> Consider how the individual impresses others on first meeting. The first impression may be good or bad. He does not attract attention by manner. Antagonizes by undue aggressiveness. Shy, retiring, colorless. Forceful impression. Agreeable, socially acceptable.

The directions read as follows:

> In the space below, make loops at your natural speed. Ready. Begin.

An illustration of two loops is inserted in the middle of the line. The time for this test is twenty seconds. The test is scored on the basis of the average millimeter measure per loop.

Tests VIII-B-C-D are handled as one, and are designed to measure "Drive." The time for each part is twenty seconds. The forms are scored on the basis of the average millimeter measure per loop. In Test VIII-B the subjects make loops at their natural speed, but with the eyes closed. In VIII-C they make loops while keeping their eyes on the examiner's pencil and counting taps. He taps at the rate of one per second. In VIII-D the subjects make loops while counting the number of times the examiner points to the right. During the test he points first to the right and then to the left. The subjects note at the bottom of the page the number of "right" indications. It will be noted that in Test VIII-B-C-D three forms of distractions are provided. In VIII-B the subjects work with eyes closed, without visual guidance. In VIII-C the distraction is visual and auditory and in VIII-D the distraction is visual.

Test IX is designed to measure "Self-Confidence." The 8½ inch by 10½ inch page contains forty pictures, size 2.5 by 1.5 cm. The examiner holds up the little booklet used in Test IV and says,

> You remember the pictures you were shown at the beginning of this test. Those pictures, with others, appear here. Draw a circle around every picture you remember having seen. If you are absolutely sure you remember a picture, draw a double circle around it, to show you are very confident. Take all the time you need. Speed does not count. Ready. Begin.

The test is scored on the basis of the number of pictures doubly circled. Four minutes are allowed for this test.

The same pictures are used in Test X, designed to measure "Reaction to Suggestion." The examiner again holds up the booklet used in Test IV and says,

"Put a cross through every picture that was printed in the booklet in color."

Then he sits down. No other explanation or suggestion is given. Three minutes are allowed. The test is scored on the basis of the number of pictures containing crosses.

Test XI has been named "Sticking to Decisions." The directions read as follows:

In a moment we shall turn back to Test I. You may make any changes you wish in the choice of the pictures there. Run lines through the crosses that indicate your first choice, and put a check mark under the picture you like best. When you are finished, look up and note the first number that appears on the blackboard. Put that number in the oblong at the end of this paragraph. Ready. Turn to Page 2. Start.

TABLE 1

Self-correlations for Non-Verbal Will-Temperament Test

(Based Upon a Repetition of the Tests after an Interval of Twenty-four Hours)

TESTS	90 LARAMIE JUNIOR HIGH SCHOOL BOYS	91 DENVER JUNIOR HIGH SCHOOL GIRLS
*Speed of Decision	+0.51 ±0.05	+0.84 ±0.02
*Speed of Movement	+0.54 ±0.05	+0.32 ±0.06
*Ability to Speed	+0.66 ±0.04	+0.38 ±0.06
Ratio, Speeded to Natural	+0.35 ±0.06	+0.21 ±0.07
*Ability to Hold Back	+0.82 ±0.02	+0.75 ±0.03
Eye-Hand Coordination	+0.08 ±0.07	+0.25 ±0.06
Persistence	+0.25 ±0.07	+0.40 ±0.05
*Expansiveness	+0.50 ±0.05	+0.85 ±0.02
*Drive	+0.76 ±0.03	+0.80 ±0.02
*Self-Confidence	+0.64 ±0.04	+0.80 ±0.02
Reaction to Suggestion	+0.44 ±0.05	+0.36 ±0.06
*Sticking to Decisions	+0.54 ±0.05	+0.24 ±0.07

The method of indicating changes is illustrated on the blackboard by the examiner.

A total of 120 seconds is allowed. The time is noted in five second intervals on the blackboard. This test might better be named "Time Spent in Reconsidering Decisions" since it is scored on a time basis rather than on the number of changes made. An individual may spend considerable time reconsidering his decisions without actually changing them. Here, again, as in Tests III-C and Test V, the low time-score must be translated into a high ultimate score, and vice versa.

The self-correlations for the parts of the Non-Verbal Will-Temperament Test are reported in Table 1 for a group of 90

TABLE 2

Correlations between verbal and non-verbal tests

(Based upon results obtained from 71 Junior High School Boys)

TESTS	CORRELATION
(Verbal) Speed of Decision (Non-V.) Speed of Decision	+0.25
(Verbal) Speed of Movement (Non-V.) Speed of Movement*	+0.08
(Verbal) Speeded Writing (Non-V.) Ability to Speed*	+0.11
(Verbal) Freedom from Load (Non-V.) Ratio Speeded to Natural	+0.12
(Verbal) Motor Inhibition (Non-V.) Ability to Hold Back	+0.53
(Verbal) Volitional Perseveration (Non-V.) Persistence	+0.02
(Verbal) Motor Impulsion (X-1) (Non-V.) Expansiveness (VIII-A)	+0.39
(Verbal) Motor Impulsion (X-2-3-4) (Non-V.) Drive (VIII-B-C-D)	+0.34
(Verbal) Self-Confidence (Non-V.) Self-Confidence	+0.16
(Verbal) Non-Compliance (Non-V.) Reaction to Suggestion	+0.13
(Verbal) Finality of Judgment (Non-V.) Sticking to Decisions	+0.47

* See previous comments on these tests. Restriction of free movement of subjects changed character of test.

Laramie Junior High School Boys and 91 Denver Junior High School Girls. In the case of the 90 boys, if we combine the scores for the starred tests, namely, "Speed of Decision," "Speed of Movement," "Ability to Speed," "Ability to Hold Back," "Expansiveness," "Drive," "Self-Confidence" and "Sticking to Decisions," we secure a self-correlation of $+0.6976 \pm 0.036$.

It was part of the problem to prepare non-verbal material that would duplicate, as nearly as possible, the test attitude of the Downey Group Will-Temperament Test. Table 2 shows the correlations between the different parts of the verbal and non-verbal tests which were supposed to measure the same traits.

TABLE 3

Correlations between intelligence test scores and scores for parts of the Non-Verbal Will-Temperament Test

Ability to Speed	+0.0219
Ability to Hold Back	−0.2329
Speed of Movement	−0.0901
Speed of Decision	−0.3937
Self-Confidence	+0.0778
Sticking to Decisions	−0.0026
Expansiveness	+0.1600
Drive	+0.1158

It is evident from an inspection of Table 2 that the verbal and non-verbal forms of the Will-Temperament Test do not measure the same traits. This fact, coupled with the low reliability of the non-verbal form, makes it a doubtful supplement to the verbal test.

Traits other than intelligence are tapped in the Non-Verbal Will-Temperament Test. Correlations between eight of the test items and the National Intelligence Test scores are shown in Table 3.

The Non-Verbal Will-Temperament Test represents a new departure in the field of temperamental testing. The present form as a whole is not sufficiently reliable to warrant its use in

situations where definite recommendations and decisions are desired. From the point of view of reliability, a few of the forms show promise. In the case of the boys the inhibition test, designated "Ability to Hold Back," shows a self-correlation of +0.82. In the case of the girls, "Speed of Decision" has a self-correlation of +0.84; Expansiveness +0.85; Drive +0.80 and Self-Confidence +0.80. In repeating tests one never can be sure how much memory of the situation has contributed in equalizing the scores. In tracing dots, or making loops as in the "Ability to Hold Back," "Expansiveness," and "Drive" tests, the memory factor probably is negligible. These forms need to be further investigated with other groups. If the indications of high reliability and low correlations with intelligence test scores continue, the tests may have validity in school and industrial situations.

NOTE: Although this test is not available for general distribution, single copies will be sent, upon request, to those interested.

PERIODICITY AND GROWTH

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Undue emphasis upon "periods of life" has resulted in the more important characteristic of growth, namely, its continuity, being obscured or underestimated. Of periodicity and rhythm in development there can be no doubt. But any thoughtful attempt to characterize a particular period must bring the conviction that each stage merges into the succeeding one and that the obvious characteristics of each period have their beginnings in preceding stages and merge gradually into succeeding ones. The difficulties inherent in classification of child development on the basis of age periods are revealed clearly by the diversity of opinion regarding the number and the duration of the periods of childhood. Few investigators agree either upon the number or the length of the periods. Chamberlain[1] has presented data showing the variety of schemes of age intervals resulting from attempts to differentiate certain periods in growth according to the degree of physical maturation therein found. The following attempts are examples of the conflicting opinions cited:

Lacassagne[2] recognizes the following periods of human life:

1. Foetal life.....
2. First childhood.....up to the 7th month
3. Second childhood.....from 7th month to the 2nd year
4. Third childhood.....from the 2nd to the 7th year
5. Adolescence.....from the 7th to the 15th year
6. Puberty.....from the 15th to the 20th year
7. Adult age.....from the 20th to the 30th year

[1] Chamberlain, Alexander Francis. The Child; A Study of the Evolution of Man. New York: The Walter Scott Publishing Co. 1911. Pp. xii + 498. (Pp. 51–107.)

[2] Chamberlain, A. F. Op. cit. p. 70.

8. Virility.....from the 30th to the 40th year
9. "Age de retour".....from the 40th to the 50th year
10. Old age.....from the 60th year till death

Tigerstedt[3] in his *Human Physiology* gives the common German division of life-periods as follows:

1. New-born child.....from birth to fall of navel-string. Age 4–5 days
2. Suckling.....from 4–5 days to 7–9 months. (First dentition)
3. Later childhood.....from 7–9 months to 7th year. (Second dentition)
4. Boyhood.....from the 7th year to the 13th or 14th year
5. Youth.....from the 13th or 14th year to age 19–21
6. Mature age.....from the 19th or 21st year up to age 45 or 50
7. Later manhood and old age..from age 45 or 50 on.

Macdonald[4] concludes that the human body has the following six periods of growth:

1. From birth to the 6th or 8th year
2. From the 11th to the 14th year
3. From the 16th to the 17th year
4. From the 17th to the 30th year
5. From age 30 to 50
6. From age 50 on

From the above examples, the difficulty of hard and fast classification of growth periods is at once apparent. However, the human organism possesses what seems to be a mania for cataloguing. The result has been manifold, elaborate attempts to partition childhood into periods of development. These attempts have not been confined to physical maturation but have included almost every known human characteristic that

[3] Ibid., p. 70.
[4] Ibid., p. 72.

manifests growth to any degree. Lesshaft[5] exemplifies a common tendency to develop "psychic" periods of growth:

1. The new-born child.....Chaos period
2. To about the 2nd year.....Reflex rational period
3. Up to school age.....Concrete imitation period
4. Up to about 20 years.....Abstract imitation period
5. Ripe age of man.....Critico-creative period

Valentin[6] from the point of view of developmental psychology, divides the life of the child as follows:

1. First few months of life.....Instinctive period
2. Up to the 6th or 7th year.....Imitative period
3. From about age 7 till puberty.....Attentive period

Guibert[7] recognizes four periods in childhood and youth as characterized by successive developments of functional aptitudes and mental functions:

1. New-born infant.....Period of subjective and instinctive life
2. Beginning before 6th month of life..Period of objective life
3. Period of social life
4. Period of professional and scientific life

Sheldon[8] finds that the years of childhood from four to fourteen contain two distinctly marked periods:

1. Ages 4 to 10.....Period of imitation
2. Ages 10 to 14.....Period of invention

Certain writers have not been content with a differentiation of periods on the basis of certain fundamental universal human traits but have selected special interests and concocted epochs to correspond with changing manifestations of these interests. Miss Mary A. Barnes[9] finds the "historical sense" appearing

[5] Ibid., p. 80.
[6] Ibid., p. 80.
[7] Ibid., p. 81.
[8] Ibid., p. 83.
[9] Ibid., p. 87.

as early as seven. This sense undergoes the following development.

1. From 7 or 8 to about 12 or 13	Period of striking biographies and events
2. From 14 or 15 up to about entrance to college or after	Period of interest in "the statesman, thinkers, poets, as successors to the explorers and fighters of the earlier period"
3. College years	The age of monographic special study

Again, Professor Earl Barnes and Miss Estelle M. Darrah[10] find the following periods of "law recognition."

1. From age 6 or 7 to age 10 or 12	Period of law-ignoring
2. From age 10 or 12 to about age 15	Period of law-recognition (Personal authority is replaced by obedience to rule and law)

There has long existed a tendency for educational and sociological theorists to delimit the social development of the child and to ascribe to him periods in the development of social sense. The periods are defined often with little precision; the results of the various attempts are to no small degree controversial. The following is a popular example of this practice:[11]

1. Presocial stage	This lasts most of the first year
2. Imitative and socializing stage	Culminates at about 3 years
3. Individualizing stage	Culminates at about 6 years
4. Competitive socializing stage	Culminates at about 12 years
5. Pubertal or transitional stage	Culminates at about 18 years
6. Later adolescence	Culminates at about 24 years

The variation in periods which results when classification of growth stages is attempted may be occasioned by the very

[10] Ibid., p. 88.

[11] Kirkpatrick, E. A. The Individual in the Making. Boston: Houghton Mifflin Co. 1911. Pp. ix + 339. (P. 59.)

complexity of such vague traits as sociability, etc. The attempts to classify growth stages of play behavior on the basis of chronological age show that the disagreement in reference to age periods is not lessened when classification is made upon a single basis, namely, that of the play periods of childhood. There is no general agreement regarding either the *number* or the *duration* of the growth periods in connection with play manifestations. The following examples exemplify the existing confusion in this regard:

CLASSIFICATIONS OF GROWTH STAGES IN PLAY BEHAVIOR

Dr. Joseph K. Hart's classification:[12]

1. The segregative level.....Children to age 6, 7, or 8
2. The group level.....Children to age 12, 13, 14, or 15
3. The team level.....Upward to maturity

Joseph Lee's classification:[13]

1. First three years..Creative impulse begins to manifest itself
2. Ages 3 to 6.....Age of impersonation
3. Ages 6 to 11....."Big Injun" or age of self-assertion
4. Ages 11 to 14.....Age of loyalty
5. Ages 14 to 21.....Apprentice age

George E. Johnson's classification:[14]

1. Ages 0 to 3
2. Ages 4 to 6
3. Ages 7 to 9
4. Ages 10 to 12
5. Ages 13 to 15

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[12] Quoted in The Normal Course in Play. Prepared by the Playground and Recreation Association of America. New York: A. S. Barnes and Co. 1925. Pp. x + 261. (P. 70.)

[13] Quoted in The Normal Course in Play. Op. Cit., p. 71.

[14] Johnson, George Ellsworth. Education by Plays and Games. New York: Ginn & Co. Pp. xiv + 234. (P. 65 ff.)

Henry S. Curtis' classification:[15]

1. Ages 0 to 6.....Imitative stage
2. Ages 6 to puberty.....“Big Injun” stage
3. Puberty on.....Team games

Luther Gulick's classification:[16]

1. Ages 0 to 3.....Babyhood
2. Ages 3 to 7.....Early childhood
3. Ages 7 to 12.....Childhood
4. Ages 12 to 17.....Early adolescence
5. Ages 17 to 23.....Later adolescence

Bowen and Mitchell's classification:[17]

1. Ages 0 to 6.....Babyhood or early childhood
2. Ages 6 to 12.....Later childhood
3. Ages 12 to 15.....Early adolescence
4. Ages 15 to 18.....Later adolescence
5. Ages 18 to 40.....Maturity

Croswell's classification:[18]

1. Ages 6 to 9..... Objects used symbolically
2. Ages 9 to 13.....Vigorous exercise of the whole body
3. Ages 14 and above..... The creative spirit prevails

Kirkpatrick's classification:[19]

1. First 5 years..... Period of play
2. Ages 5 to 10..... Participation in team games
3. Ages 12 and above..... Participation in games and sports

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[15] Curtis, Henry S. Education Through Play. New York: The Macmillan Co. 1922. Pp. xix + 359. (P. 9.)

[16] Quoted by G. Stanley Hall in Youth. New York: D. Appleton and Co. 1920. Pp. x + 379. (P. 83.)

[17] Bowen, Wilbur P., and Mitchell, Elmer D. The Theory and Practice of Organized Play. New York. A. S. Barnes and Co. 1923. Vol. I. Pp. viii + 402. (P. 249f.)

[18] Croswell, T. R. Amusements of Worcester School Children. Ped. Sem., 1899, vi, p. 214–71 (p. 231).

[19] Kirkpatrick, E. A. Fundamentals of Child Study. New York: The Macmillan Co. 1903. Pp. xxi, + 384. (P. 152.)

It is obvious that few of the investigators agree upon *the number or the length* of the periods associated with the child's play life. One asks why such diversity of opinion should exist. The writers feel that the complexity of play is one cause of this condition. Play is a behavior manifestation of so many variables that different aspects are conspicuous at different times and are observed by different writers as characteristic of the total phenomenon.

Most of the preceding classifications in reference to play were made prior to the introduction of quantitative measurement. Since the introduction of objective mental tests, not one test has been found which yields a very startling difference for groups in successive age levels. The tests all show continuity rather than periodicity in mental development. It is probable that these tests, which show no sudden evolution in the child's ability to think, furnish good illustrations of the child's intellectual growth. It seems obvious that most subjective descriptions of periods of development have been exaggerated somewhat; one reason being the fact that large differences within a given age group are always to be found. It is probable that periodicity exists only in the sense that one period of three or four years duration differs from another period of similar length in conspicuous degrees. The change from one period to another is always gradual however, and never abrupt.

The following study of play shows clearly that the characteristic features of each period develop gradually, have their beginnings in preceding stages and merge gradually into succeeding ones.

METHOD

The Lehman Play Quiz was administered to over 6000 children in grades III to XII in the public schools of Kansas City, Missouri. The Play Quiz is devised for children in grades III to XII. The children are asked to indicate among a comprehensive and catholic list of 200 activities *only those* in which they have engaged *during the preceding week*. The

children are later asked to designate those activities in which they participated *alone*.

For each child the total number of play activities engaged in during the preceding week was ascertained. The number participated in with one or more additional children was next determined. The per cent of the total activities that the social activities represented was designated the index of social participation. Thus an index of social participation of 80 in-

TABLE 1

Play data for 6881 children

C.A.	FREQUENCIES	MEAN NUMBER OF ACTIVITIES ENGAGED IN	MEAN INDEX OF SOCIAL PARTICIPATION
7½	84	44.26	62.01
8½	468	40.56	63.25
9½	935	42.37	61.70
10½	981	37.67	60.58
11½	748	36.86	58.12
12½	903	34.01	55.69
13½	946	31.52	55.65
14½	848	28.58	52.92
15½	573	27.45	52.28
16½	288	25.91	50.56
17½	82	24.93	52.04
18½	25	25.50	52.32
	6,881		

dicates that 80 per cent of the activities engaged in by the child were ones in which one or more other children also took part.

Table 1 shows (*a*) the number of children of various age levels included in the present study, (*b*) the mean number of activities engaged in at each age level, and (*c*) the mean indices of social participation for the children in each age interval.

RESULTS

Mean number of activities in which children participate

Figure 1 shows the mean number of play activities engaged in by the children of the various age levels. It was found

that the younger children participated in a larger number of activities than did the older ones. This may be due to the limitations of the Quiz, the list having been made for younger children. On the other hand, because of increased demands upon their leisure time, older children may be denied opportunity for versatility in play.

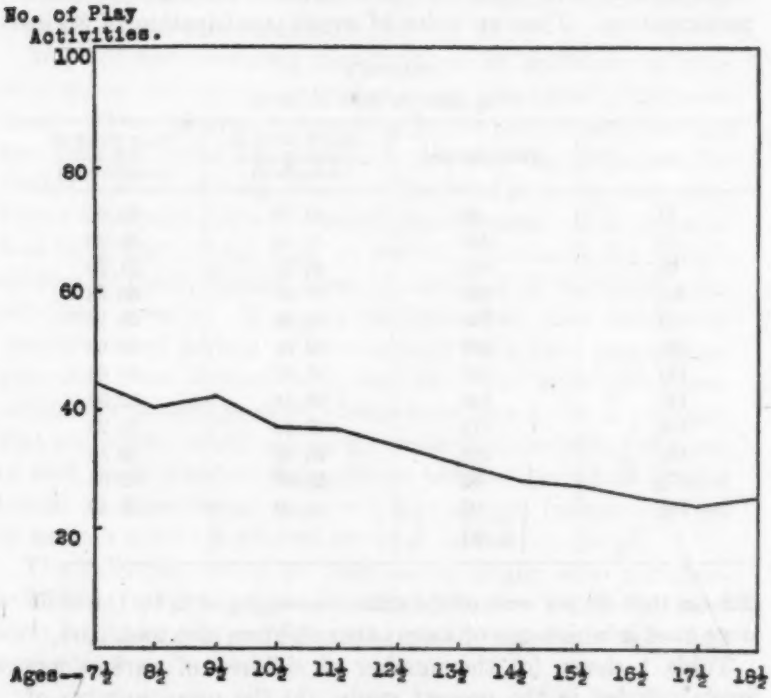

FIG. 1. NUMBER OF PLAY ACTIVITIES ENGAGED IN DURING THE COURSE OF ONE WEEK BY PERSONS OF VARIOUS AGE LEVELS

Figure 1 shows also that the transition from age to age is very gradual. It brings out clearly the fact that there are no single age levels at which the diversity of interests suddenly decreases or increases by spurts. In a previous article it was shown by one of the present writers that as regards participation

in a particular play activity, the transition from age to age is in most instances very gradual.[20]

Social participation in play behavior

Figure 2 shows the index of social participation for groups of children of various age levels. Very large individual differ-

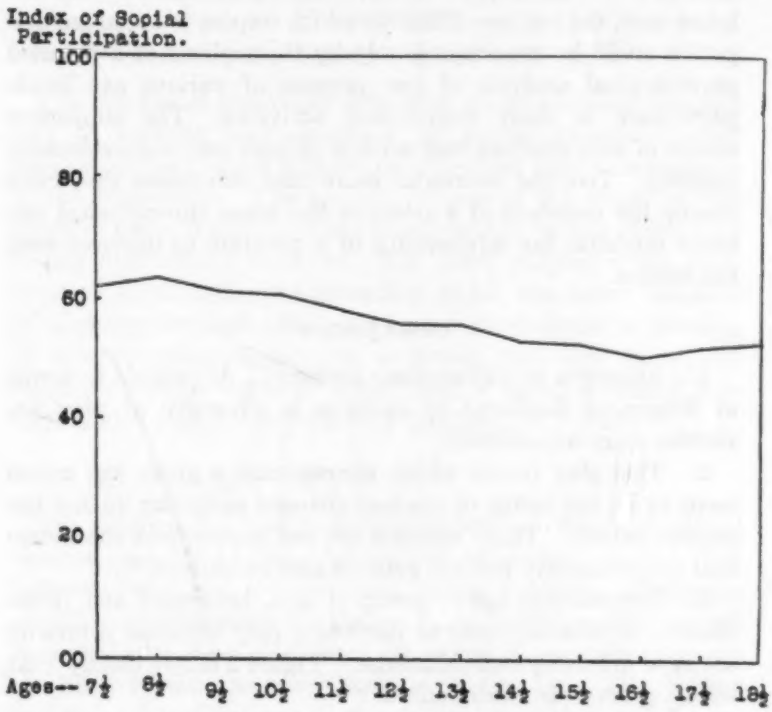

FIG. 2. THE INDEX OF SOCIAL PARTICIPATION FOR CHILDREN OF VARIOUS AGE LEVELS

ences exist at every age level in this regard. As compared with the individual differences found at the various age levels, the

[20] Lehman, Harvey C. Growth Stages in Play Behavior. Ped. Sem. June, 1926, p. 273–289.

mean differences between the various age levels are not especially significant.

It is, of course, true that figure 2 presents only partial data regarding social participation in play behavior. There is probably a *quality* as well as a *quantity* of social participation. The real differences with respect to social participation may therefore be qualitative rather than quantitative. In the latter case, the real age differences with respect to social participation could be ascertained only by the method of a detailed psychological analysis of *how* persons of various age levels participate in their recreational activities. The subjective nature of such analyses makes them difficult and of questionable validity. Too, the enormous individual differences that exist among the members of a group of the same chronological age make doubtful the advisability of a program to discover such tendencies.

CONCLUSIONS

1. Attempts to differentiate certain C. A. periods in terms of differences displayed by children in diversity of play activities seem unjustifiable.

2. The play trends which characterize a given age group seem to be the result of gradual changes occurring during the growth period. These changes are not sudden and characterized by periodicity but are gradual and contingent.[21]

3. Nor can any age or group of ages, between 8 and 19 inclusive, be characterized as disclosing play behavior primarily social or primarily individualistic. Figure 2 shows clearly that such a practice is unwarranted.

[21] Additional evidence in support of this thesis is presented in the, Pedagogical Seminary for June, 1926, xxxiii, p. 273–289.

A CLASS-ROOM EXPERIMENT IN LOGICAL LEARNING

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The purpose of this paper is to show the relationship between rate of learning and retention by actual experimentation with the subject which is being taught under normal conditions of the class-room. The second purpose is the study of the effective use of learning curves in increasing the rate of learning among high school students. The third purpose is the presentation of a method of procedure which was found valuable in studying the individual differences of students in learning an informational subject. It is hoped that this study will stimulate further research in the field of learning school subjects under school conditions by teachers in service.

METHOD

The subjects for this investigation were sixteen high school Seniors studying Civics, meeting five times each week. The instructor prepared a typewritten outline consisting of a series of problems with items for their solution. This outline served as a guide for class discussion. A series of questions without the answers were prepared for the pupils' use. The outline and the typewritten series of questions furnished by the instructor and the writing paper and pencils furnished by the students were the only materials needed for this experiment.

The hour on each day was divided into two parts: the discussion period and the reaction period. The discussion period was utilized by the instructor in presenting problems along with the items for the solution of these problems. During this period the pupils were encouraged to ask any questions

TABLE 1

Composite scores of elements learned in Civics by the logical method for twenty consecutive days

INDIVIDUAL	DAYS																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A. A.	20	34	46	50	52	58	73	89	99	115	134	140	154	183	206	220	229	239	257	270
C. B.	44	58	111	115	156	163	183	197	216	257	273	274	275	303	339	385	427	468	507	518
K. E.	13	18	28	33	36	51	43	58	78	85	93	106	115	132	156	163	169	198	199	203
P. G.	17	39	44	56	58	105	111	115	140	156	183	187	216	222	236	242	240	257	274	280
E. J.	42	35	53	57	58	105	115	151	156	171	183	209	216	257	262	269	287	303	339	352
G. J.	33	40	48	57	58	110	115	143	156	175	183	216	231	255	257	278	287	281	303	313
R. K.	28	41	48	52	55	58	110	115	144	156	183	216	257	270	273	285	303	339	360	385
A. K.	15	30	38	52	56	58	73	115	132	147	156	177	173	183	213	232	238	257	277	303
M. M.	33	43	45	56	58	90	109	115	156	183	203	207	216	237	246	257	269	263	299	303
Z. P.	33	51	58	94	113	115	156	183	200	216	253	257	272	278	303	339	327	355	385	417
T. P.	38	47	53	54	58	107	115	140	150	156	180	179	181	183	205	216	235	246	257	274
R. P.	28	40	38	55	58	100	97	115	152	153	176	183	206	212	211	216	253	257	263	303
R. S.	24	39	52	57	58	105	115	156	182	183	193	217	229	249	257	258	263	274	275	296
M. S.	39	51	55	58	96	115	138	156	178	183	202	212	255	257	269	294	299	323	326	327
W. T.	23	36	43	51	57	58	95	115	127	156	177	180	183	216	246	257	265	263	303	316
B. W.	27	39	53	58	103	115	149	156	183	216	240	257	272	282	289	302	318	327	336	339

which would aid them in understanding the problems. The reaction period was virtually a testing period. It was at this time that the pupils were asked to answer as many of the questions as possible. The questions were presented in typewritten form and pupils had to give the answers in writing. These papers were graded and the number of correct items to the problems was recorded for each pupil. On each day the instructor read the pupils' names and then their composite scores. The score represented the total number of items learned from the very first day of the experiment. The composite scores for the pupils are found in table 1.

The problems were grouped according to large principles. The first principle involved seventeen problems with fifty-eight items for their solution, the second principle fourteen problems with fifty-seven items. A small portion of the outline on the first and second principles is here presented.

1. What is the first minor principle under the great principle "Promoting Right Relations Among Men?"
   Ans. Restraining Wrong-doers.
2. What are the eleven causes of crime?
   Ans. Heredity, environment, poverty, ignorance, bad habits, mental deficiency, lack of will power, desire for excitement, laziness, unemployment, and failure to enforce laws.
3. Treason belongs to which of the five different forms of crime pointed out by Hughes?[1]
   Ans. Offenses against the state.

1. What is the second minor principle discussed by Hughes under the great principle, "Promoting Right Relations Among Men?"
   Ans. "The Treatment of Foreigners."
2. All foreigners in coming to this country sought at least two distinct things. What were they?
   Ans. a. Better social conditions. b. Better economic conditions.

Individual differences were taken care of in this manner: On the first day no student gave all the items when the problems

[1] Hughes' "Problems of American Democracy" was used as a basic text.

were presented. The same problems were, therefore, discussed for a second time on the day following the first test. It was found, however, that after this second discussion period one student gave all the factors necessary for the explanation of the first principle. Since the instructor desired that the rapid student should progress as rapidly as possible, on the third day of the experiment the second principle was discussed but the pupils who were working on the first principle were allowed to ask any questions bearing on it. It is pertinent for the reader to get this idea: no pupil was permitted to go on to the second principle until he had learned all the factors necessary for the

TABLE 2*

The per cent gain in efficiency in learning Civics by the logical method. The first ten days compared with the last ten days

	INDIVIDUAL															
	A. A.	C. B.	K. E.	P. G.	E. J.	G. J.	R. K.	A. K.	M. M.	Z. P.	T. P.	R. P.	R. S.	M. S.	W. T.	B. W.
Per cent gain	63	13	64	9	40	19	79	18		9.8	4.7	20		0	20	0
Per cent loss									25				41			

* This table is derived from table 1.

understanding of the first principle. In this way thoroughness was stressed throughout the experiment.

Logical learning was also stressed throughout the experiment; rote learning was discouraged. The pupils were, in addition, encouraged to learn meanings and were asked to learn the material in their own words.

RESULTS

What is the effect of the use of learning curves on motivation in learning?

The data found in table 1 were valuable to both the instructor and the pupils. To the instructor these data meant the stimulation of spontaneous interest and zeal in learning

among the pupils. Unquestionably every wide-awake teacher realizes the great value of these factors as requisites of effective learning. In fact the interest and zeal mentioned here were not of the "forced" type but were very natural and effective. On the part of the pupils these data meant the comparison of their progress from day to day with other members of the group, thereby stimulating emotional incentives to work up

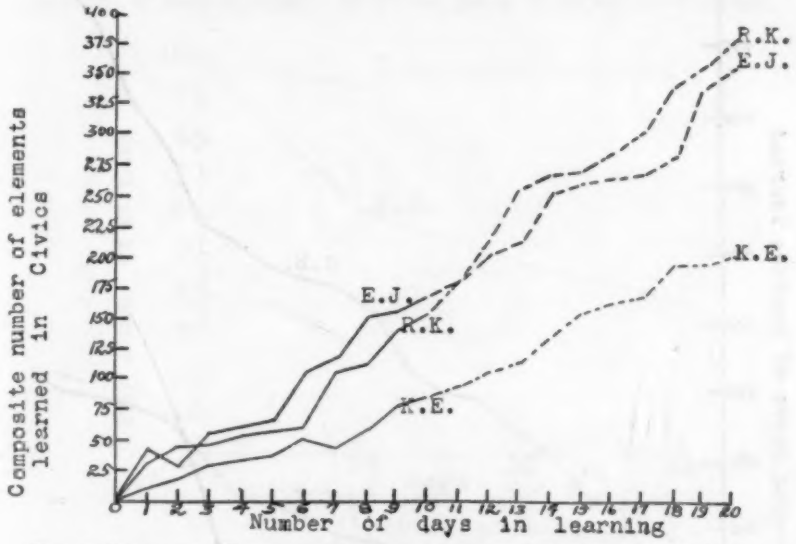

FIG. 1. LEARNING CURVES OF THREE SENIORS, E. J., R. K., AND K. E., SHOWING ACTUAL IMPROVEMENT OF 40, 79 AND 64 PER CENT, RESPECTIVELY

First ten days compared with last ten days

to their capacities. The effect of interest and zeal, and emotional incentives may be noted by an examination of table 2. Figure 1 illustrates the learning curves as prepared by the pupils. (Only three of the sixteen are here presented.) It is interesting to note the change in the direction of the curves after the first ten days of the experiment.

Individual differences are pointed out

Individual differences in learning are well illustrated by noting figure 2. This was one of the outstanding features of

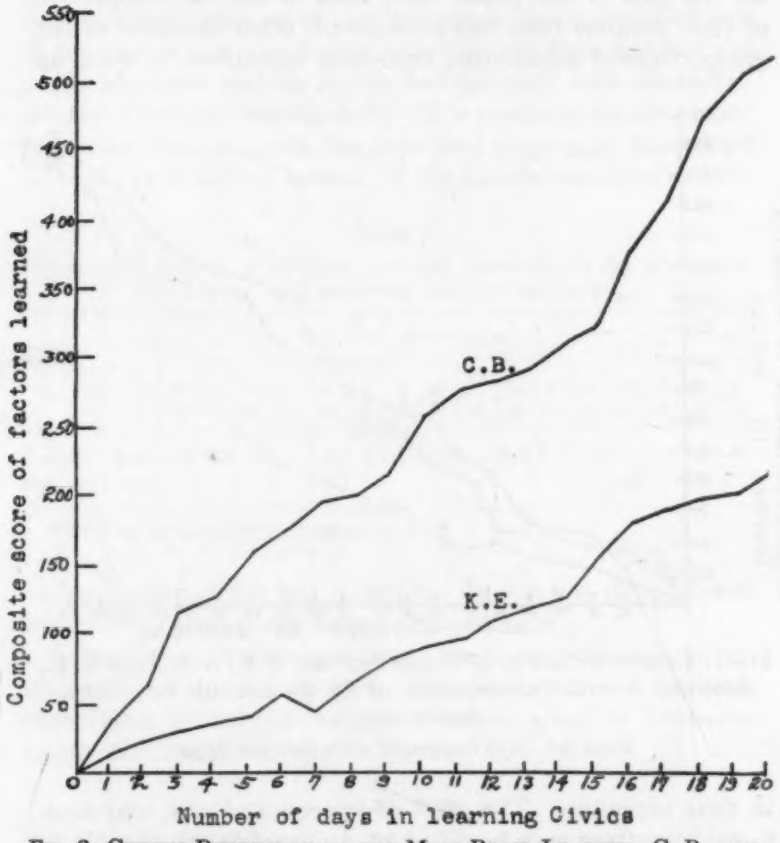

FIG. 2. CURVES REPRESENTING THE MOST RAPID LEARNER, C. B., AND THE SLOWEST LEARNER, K. E., AMONG A GROUP OF 16 SENIORS IN LEARNING CIVICS BY THE LOGICAL METHOD

the experiment, namely, each pupil was permitted to progress at his own natural rate. It is clearly shown that pupil C. B.

learned more items in nine days than K. E. learned in twenty days. Throughout this experiment subject C. B. is spoken of as the most rapid learner and subject K. E. as the slowest learner.

Is it advantageous to learn rapidly?

This question will not be settled until we have a voluminous amount of data to offer. If we are going to apply our findings

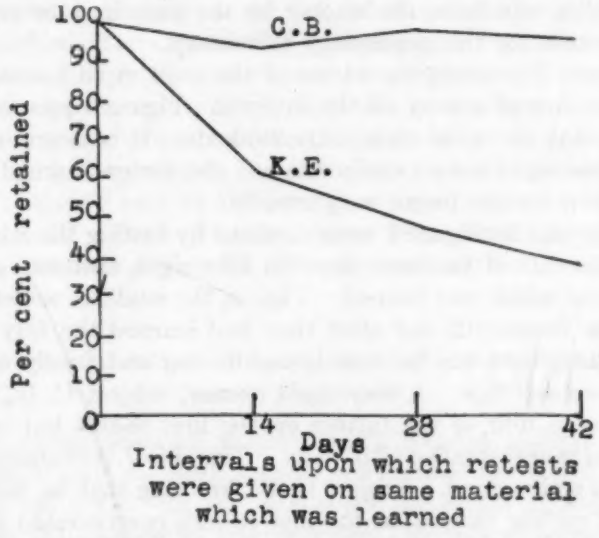

FIG. 3. FORGETTING CURVE FOR A VERY RAPID LEARNER, C. B., AND A VERY SLOW LEARNER, K. E.

to the class-room then the data should be collected under normal conditions of the class-room. Neither the learning of nonsense syllables by adults nor the testing of rote memory will contribute a great deal to the solution of the problem.

It is not uncommon to hear teachers support the idea that students who learn school subjects slowly, remember them longer than those who learn them rapidly. They contend that the familiar phrase: "Easy come, easy go," is a truism. They

also say that the slow learner does his thinking at a deeper level and therefore the impressions which are made upon his mind are more permanent. Norsworthy found the contrary to be true; the more rapidly we learn the more permanently we retain.

The data here presented corroborate Norsworthy's results. The data presented in this article, however, were collected under widely different conditions and for this reason the results have their significance. The class in Civics was substituted for college students, the teacher for the experimenter and the class-room for the psychology laboratory.

Figure 2 presents the curves of the most rapid learner and of the slowest among all the subjects. Figure 3 presents the forgetting curves of these same students. It is clearly shown that the rapid learner easily retained the factors learned while the slow learner forgot very rapidly.

The data for figure 3 were obtained by testing the students at intervals of fourteen days on fifty-eight elements of the material which was learned. That is, the students were tested on the fourteenth day after they had learned the fifty-eight elements, then on the twenty-eighth day and finally on the forty-second day. A very rapid learner, subject C. B., could not recall four of the factors on the first re-test but on the second re-test recalled all of them. This, I feel, is characteristic of the active mind. Subject C. B., knowing that he failed to recall certain factors on the first re-test, concentrated on the recall of these factors resulting in his answering all fifty-eight elements on the second re-test. On the third re-test he could not recall one factor. On the other hand the very slow learner forgot the material very rapidly. Subject K. E. failed to recall 21 elements after fourteen days, 29 elements after twenty-eight days, and 33 elements after forty-two days.

CONCLUSIONS

Measurement of pupils' progress while learning an informational subject can be made as effective as when learning the more formal subjects

In the formal subjects—spelling, reading and arithmetic—many improved methods are being applied with very gratifying results. It is a fact that the measurement of the pupils' progress is less difficult in these subjects as compared with the measurement of progress in the informational subjects. It is, therefore, very natural that the principles—"beating one's own record" and "show the pupil his progress, daily, weekly, monthly"—received greatest impetus in teaching the tool subjects. Since these are accepted principles of method in teaching spelling, reading and arithmetic, it is my opinion that these principles may be of tremendous value in the teaching of all subjects. These two principles were actually applied throughout this experiment here recorded with a great deal of success.

In this experiment the maximum amount of interest was kept up among the pupils

The casual observer would readily see the difference in interest among the students who work under the above mentioned principles. In the class-room the pupils showed the keenest satisfaction in real progress. In this experiment it was discovered that the interest was not only present during the class period but pupils would discuss their progress with other pupils and with their parents. The pupils showed so great interest in this experiment that they requested other teachers to use the same plan in the other subjects which they were pursuing. At the request of the students the plan was successfully introduced in the following subjects—Sociology, Economics, American History, Senior English.

For the teacher to know individual differences in learning and retention is very significant information

One need scarcely remark that it is a matter of great importance for the teacher to be able to determine whether the material which a child learns is retained in a permanent or in merely a transitory manner. After only a few experimental days had passed, it was possible to select the speedy learners, the moderately speedy ones and the slow learners. By observing these groups it was noted that the adaptation of each differed widely from the others. Certain persons were typically rapid in adaptation, and others were typically slow to adapt; and to this variation we might attribute in part the difference between the rapid and the slow learner.

So far as retention is concerned, it is advantageous to learn rapidly

The coefficient of correlation between rate of learning and the amount of material retained was worked out by the Spearman rank method. The data found in Table I were used in determining the rate of learning while a voluminous amount of material in the possession of the writer was used to give the index of retention. The data for the index of retention were obtained by giving re-tests on the same material at various intervals throughout a period of two months. The coefficient (16 cases) is definitely positive and is very high: $r=0.71\pm0.087$.

As stated earlier in the article, this problem will not be solved until we have voluminous data, therefore, these data are not conclusive. It is hoped that this brief experiment may contribute a small part to the solution of the stated problem.

THE DIAGNOSTIC VALUE OF GROUP TESTS AS DETERMINED BY THE QUALITATIVE DIFFERENCES BETWEEN NORMAL AND FEEBLE-MINDED CHILDREN

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The purpose of this investigation is an attempt to determine the diagnostic value of group tests as determined by the qualitative difference in performance of normal and feeble-minded children. It appears that in a group test there are certain tests in which feeble-minded children are apt to fail and other tests in which feeble-minded children do better than normal children of the same intelligence level. That is, that while all the tests are of approximate equal difficulty for normal children, some tests are more difficult and others easier for feeble-minded children. By a special study of group tests it was hoped that qualitative differences would present themselves and thus it would be possible to recognize feeble-mindedness more easily in group testing by a special study of those tests in which the feeble-minded are more apt to pass or fail. Group tests are good working tools and are here to stay, and although they are not ends in themselves, they make excellent instruments for further diagnosis. A crucial step in the research of intelligence of the present day it seems is an analysis of the means which are now in use for the measuring of intelligence.

We have now come to learn that intelligence is of all degrees and that the feeble-minded form that portion of humanity that has not a sufficient quantity of the qualities that enable a person to get along in society. It is not that they possess certain qualities and lack others that make them feeble-minded, but it is the degree to which they possess all the qualities we find

in men. Doll[1] found in his study of feeble-minded at Vineland, using the Binet test, that in general, normal children develop intellectually more consistently than a potential defective. In other words, that the feeble-minded "scatter," failing in tests one would expect a normal child of that age to pass and succeed in others, not expected. Doll says,

> The feeble-minded tend to be weakest in the tests involving new situations and strongest in those involving experience.

There are several explanations which he gives for this. He says,

> It may be that defectives support their lame intelligence, poor comprehension, and lack of judgment, with the crutch of memory, and that some tests which are good tests of intelligence for normals are with defectives tests of accomplishment or show the results of mental substitution much as the senses of touch and hearing with the blind take over to considerable degree the function of vision.

Therefore we have a different clinical picture. Although they have the same mental rating normals and defectives arrive at it in characteristic ways. In accordance with this hypothesis, that the feeble-minded differ in their qualitative performance in individual scales of intelligence examinations, it must equally be true that there are qualitative differences present in group tests.

In order to make the results of this investigation comprehensive children of as narrow a range of mental ages as possible were used, in both the feeble-minded and control group. The feeble-minded group was selected from the school children at the Training School at Vineland, New Jersey. There were fifty boys and thirteen girls, making a total of sixty-three. The normal children, forming the control group, were selected from a public school in the town of Vineland. They were at grade for their chronological age and were conceded as normal by their principal and teachers. In order to get children of approximately the same average mental age as the feeble-minded group it was necessary to select children of about seven

[1] Doll, Edgar A. Preliminary Notes on the Diagnosis of Potential Feeble-mindedness. Training School Bulletin for May, 1916.

years one month, in chronological age. Fifty boys and thirteen girls were thus selected from the first and second grades. The average chronological age for the normal children was seven years five months; for the feeble-minded group thirteen years.

Four primary group tests of general intelligence were selected, and given two at a time to groups of fifteen in the following order:

1. Detroit First-Grade Intelligence Test
2. Pintner-Cunningham Primary Mental Test for Kindergarten and First and Second Grades

3. Haggerty Intelligence Examination—Delta 1
4. Pintner Non-Language Mental Test

A composite mental age was computed for each child by taking the average of the mental ages obtained in the four group tests. A comparison of the feeble-minded group with the normal group in regard to these composite mental ages, shows our groups to be practically identical as to level of intelligence. (This is to be expected as the groups were selected with that end in mind.) The range of mental ages for the feeble-minded group was four years six months to nine years, nine months, while the normal group ranged from five years, seven months to nine years, nine months. The Median Mental Age was seven years three months for the feeble-minded group against seven years, four months for the Normal group. The normal group exceeded the feeble-minded group by three months on the Mean Mental Age. The Average Deviation for the feeble-minded was eleven months and the Coefficient of Variability was 0.13. For the normal group it was seven months and 0.079 respectively.

An Intelligence Quotient was computed for each child which shows clearly that we are dealing with two distinct groups although their mental level is practically identical. The Mean I.Q. for the feeble-minded group and normal group is 56 and 99 respectively. The feeble-minded group range from 33 to 83 and show a Coefficient of Variability of 0.14. The normal group I.Q.'s range from 76 to 116 with a Coefficient of Variability of 0.09. The Coefficient of Correlation was com-

puted between the Binet Mental Age of the feeble-minded group as compared with the Composite Mental Age and found to be 0.74, with a probable error of 0.04. The Coefficient of Correlation between the chronological age and composite mental age for the normal group was found to be 0.33 with probable error of 0.08.

A study of the raw scores obtained from each of the Intelligence Tests bears out the fact that our groups are practically identical as far as level of intelligence is concerned. In the Detroit the average raw score for the normal group exceeds that of the feeble-minded group by 1. In the Pintner-Cunningham the excess is 2; in the Haggerty 4; and in the Non-language it is 3.

The Coefficients of Variability show the feeble-minded group is more variable than the normal, and here we begin to see the first qualitative difference between the groups, namely, that the feeble-minded are more variable. This is true although the quantitative results are practically the same for the two groups.

An examination of the separate tests within each group test was made to see if there are certain types of tests that show qualitative performances that distinguish the feeble-minded and normal. In each group intelligence test the separate tests were listed and the percentage of items correct in each test was estimated. In the Detroit Intelligence Examination there are two tests, "Directions" and "Counting," in which the normals greatly exceed the feeble-minded. Two tests, "Similarities" and "Symmetries" in which the feeble-minded excel the normals; and ten tests in which there is no significant difference in the results. In the Pintner-Non-language test we find the feeble-minded exceeding the normal in the "Easy" and "Hard Learning" tests, which are tests of the same general character. In the Haggerty Intelligence Examination we find the greatest difference between the average percentage of items correct for the normal and feeble-minded, the difference being ten points, four in excess of any other group test results. This would tend to show that qualitative differences would be

more apt to show up in this test than in the others. In this test we find the feeble-minded exceeding the normals in the Symbol-Digits Test. (This is compatible with the Easy and Hard Learning tests in the Non-language Scale.) These tests where it is not a question of quality but quantity, where the problem met is not increasingly harder, where the reaction is more stereotyped, the feeble-minded do better than the normals. In every other test of the Haggerty Scale the normals exceed the feeble-minded in percentages of items correct to more than 10 per cent. In the Oral Directions Test the normals exceed the feeble-minded by 17 per cent. Undoubtedly normal children are better able to follow directions than feeble-minded children of the same mental level. In Copying Designs the normals exceed the feeble-minded by 15 per cent, and in the Picture-Completion Test by 13 per cent. In the Word-Comparison Test the normals exceed the feeble-minded by 12 per cent, showing thereby that the feeble-minded are below the normals in ability to deal with words.

From the study of the separate tests in each test series it appears that a great many of these tests are testing the same thing. Where a test was found to be testing the same thing as a test in another series, they were grouped together for further study. An average was taken of the differences of the percentages by which the normals and feeble-minded differed when these tests were combined. The normals excelled in the Directions Test by 17.5 per cent, in the Counting Test by 15 per cent and in the Word Comparison by 12 per cent. The feeble-minded excelled the normals by 3 per cent in the Similarities Test and by 6 per cent in the Symbol-Digit Tests. In all other tests the normals excel the feeble-minded, but in no case more than 7 per cent. As a result of this we can state that the feeble-minded are not able to follow directions to the same degree as the normals of the same intelligence level. From an empirical study the examiner made while presenting these four group tests this fact is borne out. The normals needed very little actual help with the turning of pages whereas the feeble-minded were constantly getting confused by turning to the

wrong page or turning the booklet upside down. Referring to Doll[2] in his study of the potential feeble-minded he makes note that the feeble-minded tend to be weakest in tests involving new situations. The feeble-minded are not able to count or deal with words as well as the normals. Binet and Simon[3] recognized that the feeble-minded are lacking in number sense and ability to deal with words. "What is lacking in defectives is the word, the key to abstract ideas and general conceptions. The use of things is what is obvious. What the defective lacks here is penetration." In the Symbol-Digit Test, where the feeble-minded excel the normals we find in a closer examination of the particular test itself that the reason the feeble-minded do better is because it is more a test of experience than one of attacking a new problem. The training of defectives carries with it a great deal of "Matching up" because we find that this is one thing they can learn to do. And while they do better than normals in this particular test they arrive at the end in a very different manner. With the normals this test is practically one of intelligence, but with the feeble-minded it appears to be one of accomplishment.

From a detailed study of the separate tests of the Haggerty Intelligence Test we find the defectives scatter a great deal, that is, they are more likely to fail entirely on one test and succeed on another, whereas normals are more likely to do something on all the tests. We find defectives making more peculiar responses such as meaningless lines, numbers, etc. Although the two groups have the same mental rating they arrive at it in characteristic ways.

In a study of the predictive value of certain kinds of scores in intelligence tests William M. Brown[4] indicates that the number and value of zero scores possess more or less significance when taken into relation with intelligence test performance. In this present experiment we find the feeble-minded receiving eighty-

[2] Doll, Edgar A. Clinical Studies in Feeble-mindedness.

[3] Binet and Simon. The Intelligence of the Feeble-minded.

[4] Brown, William M. Journal of Educational Psychology, volume xv, no. 7, October, 1924.

three more absolute zeros than the normal group. The zero scores in the case of the feeble-minded may possibly be caused by the inability to follow directions, rather than inability to perform the test. We could not attribute them to caution or unwillingness to take a chance. In those tests where the directions were harder because they were in pantomine such as in the Non-language Test, we find a great many more zeros obtained by the feeble-minded.

SUMMARY AND CONCLUSIONS

In the scales of group tests it appears that there are certain tests more diagnostic of feeble-mindedness than others. On the whole the qualitative differences found in this investigation with group tests is similar to that of studies made with individual test series.

1. The feeble-minded tend to be weakest in tests involving new situations such as the "Directions Test." Doll found this to be true with the Execution of Three Directions and in the Patience Tests of the Binet Individual Intelligence Test. Binet notes that "The defective lacks penetration into the task set for him and if the task were made simple enough he could perform it." It thus appears that a defective very often fails to be able to follow directions to a degree far below his level of intelligence.

2. The defective is lacking in number sense and fails the "Counting Tests" far below the normal, having the same mental age as the defective.

3. The defectives are not able to read and understand the meaning of words to the extent the normals do. In the Word-Comparison Test they fall far below their mental age level.

4. Tests involving the development of interest, such as in Relationships, Associated Objects, Comparisons, and Discrimination of Size are scored higher by the normals. The development of such spontaneous interest appears lacking in the defective.

5. The feeble-minded are more variable than the normal.

This is borne out by the numer of times we find the Coefficient of Variability greater for the defectives. In fact, there is not a single instance in which the feeble-minded are not more variable. The greater amount of zero scores made by the feeble-minded bears out this tendency for scatter. Although our feeble-minded group were more variable than the normal to begin with, nevertheless the variation shown in the test series seems greater than the original variation would warrant. This is not definitely established in this paper, but would warrant additional research.

6. The feeble-minded tend to excel in tests involving experience. This is clearly brought out in the Symbol-Digits, and Easy and Hard Learning series. Doll found this to be true in the Memory for Digits and Ability to Name the Days of the Week in the Binet Individual Intelligence Test.

A STUDY OF PERCEPTION OF ADVERTISEMENTS[1]

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In the widespread application of psychological technique to the study of practical problems in advertising the process involved in the perception of advertisements has received but little attention. Recently, however, the increased use of the so-called editorial style of layout, in which the advertisement is made to resemble the story or news content of the magazine or newspaper, has served to focus interest on the cues by which the reader is able to recognize the advertisement as an advertisement. Experts are asking whether it is good business to make the advertisement too hard to perceive. In a former study[2] the writer discovered that the ease of perception seemed to play an important part in determining the amount of time spent on a given advertisement. Following up these various clues, the present investigation was initiated for the purpose of securing more accurate measures of the perceptive process.

The investigation here reported was essentially a choice reaction time experiment in which the subjects were confronted with pages from magazines and required to indicate as rapidly as possible whether each page was an advertisement or not. For the presentation of the material a special kind of tachistoscope was built, consisting of a light-proof box 18 inches wide, 20 inches deep and 20 inches high. At the back of this box

[1] A part of the data reported in this article was secured under the direction of the writer by Mr. B. H. Bardin, Graduate Student in the School of Business, Columbia University. The writer wishes to hereby acknowledge his debt to Mr. Bardin for the use of this material.

[2] Nixon, H. K. An Investigation of Attention to Advertisements. New York, Columbia University Press, 1926.

was an opening 10 by 13 inches, or of a size to frame advertisements of the *Saturday Evening Post* size. Opposite this opening was a small hole, 4 inches wide and 3 inches high, through which the subject could look into the box. Inside the box was an ordinary electric light, concealed from the direct gaze of the subject, and so located as to fully illuminate the material to be exposed. When the light was turned off the inside of the box was in darkness and the subject could see nothing of the material. With the light turned on the subject had a clear view of the material and could read even the smallest type.

This form of exposure apparatus is of course rather crude but considering the size of the material to be used it is probably more satisfactory than any falling shutter device. The subjects were so seated that their eyes were exposed to full room illumination, so that the turning on of the extra light in the box did not produce any marked change in adaptation. In every reaction there was, of course, a certain amount of visual lag to be taken into consideration. Since we were not interested in an absolute measurement of perception time of advertisements, but merely in the comparison of the performances of different types of advertisements under identical conditions of exposure, this lag is of no great importance. It seems safe to assume that the average lag was the same for the various series of advertisements used.

As just indicated, the subject sat facing the exposure box. When the light was turned on he could see the material which the experimenter had placed in the rack at the back of the box. The subject was then to decide as quickly as possible whether the page presented was an advertisement or not. He recorded his decision by releasing his pressure on one of two reaction keys which were conveniently located on the front of the box. That is, if the subject perceived the material to be an advertisement he lifted his hand from the key at the right. If he thought it was not an advertisement he raised his left hand and held down with the right.

The time between the turning on of the light in the box and

the breaking of an electric circuit by the lifting of the subject's key was recorded by means of a vibrating reed beating tenths of a second, in circuit with a telephone message counter. This apparatus proved sturdy and reliable and served to give an accurate record of the reaction time, within the limits of the rather coarse unit of time. For the practical purposes of the advertiser this tenth of a second unit is probably fine enough. In experiments aiming at exact measurement of perception time a hundredth or a thousandth of a second would of course be preferable.

Forty-nine subjects were used in the experiment, twenty-two of them women and twenty-seven of them men. They constituted a fairly representative sample of the population, with the mature student type perhaps predominating. A few of them were special students in advertising and it was found that their reaction times were slightly faster than the average for the group. All in all, the group taken as a whole may be considered as fairly representative of the bulk of magazine readers.

Studies of perception now under way in the Columbia Advertising Research Laboratory aim at the investigation of a number of factors in the perception of advertisements. The present report has to do with but one phase of the whole investigation, that of the effect of color in advertisements, with some incidental data on the effect of repetition of advertisements, and on sex differences in speed of reaction.

In this study of the effect of color the factor under investigation was isolated by the use of pairs of duplicate advertisements, one member of each pair being in black-and-white and the other member being an exact duplicate except that color had been added.[3] Twenty different pairs of advertisements were used. These forty advertisements were mixed with twenty ordinary story and editorial pages taken from the

[3] The writer is indebted to Mr. R. B. Franken of New York University, Dr. John B. Watson of the J. Walter Thompson Company, Mr. George L. Welp of the Blackman Company, for this material which they kindly supplied.

Saturday Evening Post and the *Ladies' Home Journal.* Half of these reading pages were colored, half were in black-and-white. The forty advertisements were distributed in such a way that in ten cases the colored member of the pair appeared first, with its black-and-white duplicate appearing later in the series, while in ten cases the black-and-white advertisements had the advantage of first presentation.

The advertisements and the reading pages were all mounted on heavy cardboard to facilitate their handling. The presentation of the sixty cards usually took twenty-five minutes, including a preliminary training period in which the subject was familiarized with the operation of the apparatus.

It should be mentioned that each subject usually made a number of false reactions, perceiving advertisements as reading pages, and vice versa. Almost invariably they corrected themselves immediately. In the perceptibility of individual advertisements these false reactions are of considerable interest, their frequency serving as a kind of index of difficulty of perception. In our present data we have ignored them, since they occurred with practically equal frequency in the two series under consideration.

The data on the effect of color on speed of perception of the advertisements are given in table 1. From an inspection of this table it will be seen that as far as the male subjects were concerned there was no difference between their reaction to the colored and to the black-and-white duplicates. In each case the average reaction time was a little over seven-tenths of a second.

In the case of the female subjects a slight difference appeared. This difference (not quite five-hundredths of a second) is accompanied by a fairly large S.D. so that the difference is not very reliable. When the reaction times for the males and the females are combined we find a small difference accompanied by an S.D. of practically equal size. We may conclude that in the total reaction the presence or absence of color made little practical difference.

This finding, though negative, is of some importance in

throwing some additional light on problems connected with the value of color in advertising. In another connection the writer has found that the attention to colored advertisements, as measured by the amount of time spent on them by subjects, is no greater than the attention to black-and-white duplicates. In connection with this former study of attention the opinion was expressed that the attention time to the colored advertisements might be reduced by reason of a speeding up of percep-

TABLE 1

Perception time of colored and of black-and-white advertisements

For twenty-seven male subjects:	
Average time of 20 black-and-white advertisements	7.12 tenths of a second
Average time of 20 colored advertisements	7.09 tenths of a second
Difference	0.03 (S.D. Dif. = 0.32)
For twenty-two female subjects:	
Average time of 20 black-and-white advertisements	8.57 tenths of a second
Average time of 20 colored advertisements	8.08 tenths of a second
Difference	0.49 (S.D. Dif. = 0.32)
For all subjects, male and female:	
Average time of 20 black-and-white advertisements	7.80 tenths of a second
Average time of 20 colored advertisements	7.56 tenths of a second
Difference	0.24 (S.D. Dif. = 0.23)

tion due to the subject's more rapid recognition of the colored appeal as "just an advertisement." The present data seem to disprove that theory. With a finer unit of time measurement than the tenth of a second here employed a reliable difference in favor of the colored advertisements might be found but on the basis of the present evidence that difference would be so small—probably not more than a few thousandths of a second—that for all practical purposes it would be insignificant.

This point will be clearer if we remember that some factors in the advertisement, such as style of layout, kind of illustration, and the like, may make as much as half a second's difference.

We have already noted that by the technique of the experiment each advertisement was presented twice, once in color and once in black-and-white, with the colored advertise-

TABLE 2

Perception time for the first and the second presentations of the advertisements

For twenty-seven male subjects:	
20 advertisements, first appearance, average time	7.73 tenths of a second
20 advertisements, second appearance, average time	6.48 tenths of a second
Difference	1.25 (S.D. Dif. = 0.32)
For twenty-two female subjects:	
20 advertisements, first appearance, average time	9.14 tenths of a second
20 advertisements, second appearance, average time	7.51 tenths of a second
Difference	1.63 (S.D. Dif. = 0.31)
For all subjects, male and female:	
20 advertisements, first appearance, average time	8.39 tenths of a second
20 advertisements, second appearance, average time	6.96 tenths of a second
Difference	1.43 (S.D. Dif. = 0.22)

ments getting the first presentation half of the time, and the black-and-white having first position the other half. Such an arrangement made possible a study of the effect of repetition of an advertisement on the speed of its perception. Repetition here means, of course, repetition with a slight variation. Data covering this aspect of the investigation are given in table 2.

From table 2 it is apparent that, as was to be expected,

perception was considerably speeded up on the second presentation of the material. For the male subjects alone, the female subjects alone, and for the two combined the reaction to the second presentation is more than a tenth of a second faster. In all cases the S.D.'s are small in comparison with the differences, indicating that the results are reliable.

A fact of some importance in connection with these data is that the slower subjects showed a greater speeding-up effect due to the second presentation of the advertisements, and the more difficult advertisements showed a greater change on repetition. This last is of practical importance, indicating as it does that the hard-to-perceive style of layout now being

TABLE 3

Sex differences in the speed of perception of advertisements

(40 advertisements)

22 females, average time	8.33 tenths of a second (S.D. = 0.161)
27 males, average time	7.11 tenths of a second (S.D. = 0.163)
Difference	1.22 tenths of a second (S.D. = 0.228)

Average time, all 49 subjects, = 7.68 (S.D. = 0.116).

used by several national advertisers, might confuse the readers when seen for the first time but on subsequent presentations this effect would be largely lost.

The data at hand enable us to draw some conclusions as to sex differences in the type of reaction involved in this experiment. The figures are given in table 3. It will be noted that the men tend to be speedier in their reactions than the women. This difference, a little over a tenth of a second on the average, is accompanied by a relatively small S.D. These results agree with the findings of other investigators in this field.

The average time elapsing between the turning on of the light which illuminated the advertisements and the lifting of

his hand from the key by the subject was 7.68 tenths of a second. We have already noted that a part of this time must be charged to lag in visual adjustment. This lag, however, would certainly occupy only a small fraction of the total time. In general we may say that it takes about seven-tenths of a second to perceive that an advertisement is an advertisement and to express that perception in a voluntary reaction.

The S.D. of the average just given is 0.116. The S.D. of the distribution from which that average was derived is 4.10, which will give some idea of the deviations from the average. About three-fourths of the reactions of the subjects were of more than three-tenths and less than twelve-tenths of a second. The range was from two to forty-eight tenths.

In the case of the individual advertisements used the easiest to perceive had an average reaction time (for both presentations) of 6.61 tenths of a second, while the hardest to perceive averaged 10.73 tenths of a second. The twenty advertisements used seem fairly representative and these figures just given probably afford a reliable idea of the differences in perceptibility to be encountered in general magazine advertising. The factors, other than color, that serve to produce these differences are now under investigation and will be the subject of a later report.

A FURTHER NOTE ON SCATTERING IN THE BINET SCALE

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Some psychologists have assumed that feeble-minded children are more unevenly developed than normal children. Binet and Simon hold that unevenness of mental development, the exaggeration of some mental traits while others are strikingly underdeveloped, is the prominent characteristic of the feeble-minded child. As proof of this inequality of mental development, some writers have pointed to the fact that the feeble-minded scatter more in the Binet scale than do the normal. That is, they fail more tests in lower age levels, and pass more tests above the basal age (the point in the scale where all the tests are passed successfully) than do the normal.

We have in various articles presented data on scattering in the Binet scale, based on the testing of 333 epileptics in an institution, 34 psychotics in an institution, 1181 consecutive subjects of various types in a university and public school psychoeducational clinic, and lastly 1025 consecutive cases in a school psychoeducational clinic.[1] The brief address in which the data for the last group of cases was presented[2] did not contain the figures on which the conclusions were based. This article is limited to the presentation of the tabular data and a

[1] Experimental Studies of Mental Defectives, 1912, 22ff. Problems of Subnormality, 1921, 160ff. The Phenomenon of Scattering in the Binet-Simon Scale, Psychological Clinic, 1917, 179–195. Wide Range Versus Narrow Range Binet-Simon Testing, Journal of Delinquency, 1917, 315–330. A Further Comparison of Scattering and of the Mental Rating by the 1908 and 1911 Binet-Simon Scales, Journal of Delinquency, 1918, 12–27. Intelligence Irregularity as Measured by Scattering in the Binet Scale, Journal of Educational Psychology, 1922, 140–151.

[2] Journal of Educational Psychology, 1922, 140–151.

further analysis of them. A considerable number of additional retests are available, but will not be incorporated in this article.

RELATION OF SCATTERING TO GRADE OF INTELLIGENCE

Table 1 shows the amount of advance credit (months passed above the basal age) which was earned by the subjects in the Stanford Revision of the Binet scale. As is seen from the

TABLE 1

Advance credits (in months) earned in the Stanford-Binet by children arranged into descending intelligence groups

	BOYS		GIRLS		BOTH		
	Number	Months	Number	Months	Number	Months	Years
Normal	16	26.00	2	22.00	18	25.5	2.13
Retarded	23	19.43	5	11.20	28	17.96	1.49
Backward	161	20.58	23	18.00	184	20.26	1.69
Deferred	15	18.26	6	17.00	21	17.9	1.49
Borderline	223	20.56	68	19.53	291	20.33	1.69
Potential Feeble-Minded	71	19.00	26	16.46	97	18.32	1.52
Borderline and Potential Feeble-Minded	294	20.19	94	18.68	388	19.82	1.65
Morons	86	20.83	59	20.10	145	20.53	1.71
Potential Morons	66	21.36	49	21.32	115	21.34	1.77
Morons and Potential Morons	152	21.12	108	20.66	260	20.89	1.74
Imbeciles	73	17.34	53	16.04	126	16.79	1.40
Total	734	19.98	291	18.74	1,025	19.63	1.63

classification, which is based on grade of intelligence, the normals scatter the most and the imbeciles the least. The difference in scattering between these extreme groups amounts to 0.73 of a year, the amount of scattering for the normals being 2.13 years, and for the imbeciles 1.4 years. These results were obtained by the use of a wide-range method of testing. The average number of tests given above the basal age has already been published.[3] The group which was given the

[3] Ibid., 145.

greatest number of advance tests by the scale was the Potential Moron group with an average of 28.2 tests above the basal age. An inspection of table 1 shows that this group earned 1.78 advance years, which is second only to the amount earned by the normal group. The combined Moron and Potential Moron groups were given an average of 26.3 tests above the basal age, and rank next to the Potential Morons in the amount of scattering, gaining, 1.74 advance years. Apparently the amount of scattering is dependent on the extensiveness of the testing, but not wholly, the normals, who were given only

TABLE 2

Advance credits earned according to the Stanford-Binet in three major intelligence groupings

	BOYS			GIRLS			BOTH		
	Number	Months	Years	Number	Months	Years	Number	Months	Years
Normals (including backward, retarded, and normal)	200	20.8	1.73	30	17.1	1.43	230	20.4	1.70
Subnormal (including morons, imbeciles, borderline, and deferred)	534	19.99	1.67	261	18.9	1.58	795	19.64	1.64
Feeble-minded (including morons and imbeciles)	225	19.85	1.65	161	19.1	1.59	386	19.55	1.63

19.5 tests above the base earned the largest number of advance credits, namely, 2.13 years. Our results for the normal cases are, unfortunately, based on a limited array of cases. The need of obtaining confirmatory evidence from a larger selection of such cases, and also from supernormal children, has not yet been satisfied.

Our results fail to evidence any consistency in the amount of scattering. That is, the amount of advance credit earned does not decrease consistently with decrease in the grade of intelligence, although the normals show the greatest amount

of scattering and the imbeciles the least, the decrease from the higher levels to the lower levels of intelligence is not uniform, as can be seen by an inspection of table 1.

In table 2 we have combined the diagnostic categories into three groups: the normals, including the backward, retarded and normal; the subnormals, including the morons, imbeciles, borderline, and deferred; and the feeble-minded, including the morons and inbeciles. When thus combined the difference between the groups is practically negligible, amounting to a maximum of only 0.07 of a year between the normal and the feeble-minded groups (normal excess). The normal group earns 0.06 of a year more than the subnormal group and the latter group 0.01 of a year more than the feeble-minded group.

It is interesting to compare the results of this combined classification according to the Stanford scale with the results of the same classification according to the 1908 and 1911 scales.[4] Based on the average of the two sexes according to the 1908 scale the subnormal and feeble-minded groups earn advance credits of 1.10 years while the normal group earns only 0.94 of a year. In this scale the normals earn 0.16 of a year less than the subnormals. With the 1911 scale, on the other hand, the normal group earns 1.44 years as compared with 1.32 years by the subnormal and 1.28 years by the feeble-minded groups. Here again the extreme difference amounts to 0.16 of a year. Previous analyses showed that the scattering of the normals in the 1908 and 1911 scales was artificially restricted, because they had a higher intelligence level than the other groups in consequence of which they had to be given fewer tests, since there were only a few tests available in ages above nine. No tests whatever were available above thirteen in the 1908 scale. Forty-two per cent of the normals in the 1908 scale had a basal age of from ten to thirteen years.

Limiting the comparison to those who earned over ten advance credits,[5] we find that 55.5 per cent of the normal sub-

[4] Psychological Clinic, 1917, 184.

[5] Journal of Educational Psychology, 1922, 143.

jects passed eleven or more tests above the base in the Stanford scale, while only 26.2 per cent of the imbeciles and 43.4 per cent of the morons earned that many advance credits. The percentage of normal subjects who passed eleven or more tests above the base exceeded the percentage of all the subjects passing a like number of tests by 0.8 per cent in the 1908 scale, by 8.7 per cent in the 1911 scale, and by 15.8 per cent in the Stanford scale.

The conclusion reached, therefore, from an inspection of our figures for the individual diagnostic classifications and the combined diagnostic groups is that the feeble-minded children do not scatter more than the normal ones. The opposite seems to be the case.

THE SIGNIFICANCE OF SEX IN SCATTERING

A comparison of the scattering of the two sexes according to the 1908 and 1911 scales has already been published.[6] Table 1 on this article supplies similar data for the Stanford scale.

The boys scattered slightly more in every diagnostic classification, both in the 1911 and in the Stanford scales. For both these scales the sex difference is greatest for the retarded group, amounting to 8.2 months in the Stanford and to 1.00 points in the 1911 scale. The least difference in the Stanford occurs among the potential morons, namely 0.04 of a month, and in the 1911 scale among the backward, deferred, borderline, and morons, namely 0.3 points. The results for the 1908 scale are quite different. Here the amount of scattering is slightly greater for the girls than for the boys in every classification except two, the normal group, in which the boys' excess amounts to 1.2 points, and the borderline group, in which the results are the same.

Based on the average for all the cases, it is found that the boys exceed the girls in amount of advance credits earned by 0.16 of a year in the 1911 scale, and by 0.10 of a year in the Stanford scale, while the girls exceed the boys in the 1908

[6] Psychological Clinic, 1917, 182 and 184.

scale by 0.20 of a year. When the figures for the combined groups (the normal, subnormal and feeble-minded) are analyzed, we find the same general tendency for the boys to scatter more than the girls in the 1911 and Stanford scales but not in the 1908 scale. The difference between the sexes is greatest in the subnormal group in the 1911 scale, amounting to 0.10 of a year, while in the Stanford scale the greatest difference is found

TABLE 3

Advance credits earned by the unstable groups according to the 1908, 1911, and Stanford-Binet Scales

CLASSIFICATION		1908 SCALE			1911 SCALE			STANFORD SCALE		
		Number	Average points	Average years	Number	Average points	Average years	Number	Average months	Average years
Delinquent	Boys	161	3.99	0.79	161	7.23	1.44	140	20.86	1.74
	Girls	18	7.00	1.40	18	6.83	1.36	33	16.54	1.37
	Both	179	4.29	0.85	179	7.19	1.44	173	20.04	1.67
Psychopathic	Boys	4	4.5	0.90	4	6.25	1.25	13	23.23	1.93
	Girls	3	7.33	1.46	3	8.33	1.66	2	21.00	1.75
	Both	7	5.71	1.13	7	7.14	1.42	15	22.93	1.91
Neurotic	Boys	25	4.2	0.84	25	6.92	1.38	92	22.83	1.90
	Girls	8	3.12	0.62	8	6.87	1.37	30	17.96	1.49
	Both	33	3.94	0.78	33	6.91	1.38	122	21.63	1.80
Total Unstable	Boys	190	4.03	0.80	190	7.17	1.45	245	21.73	1.81
	Girls	29	5.96	1.19	29	7.00	1.40	65	17.33	1.44
	Both	219	4.28	0.85	219	7.15	1.42	310	20.80	1.73

in the normal group, 0.30 of a year. In the 1908 scale the greatest sex difference is found also in the combined normal group, but here the girls exceed the boys by 0.26 of a year. The boys consistently scatter more than the girls in the 1911 and Stanford scales, and the girls more than the boys in the 1908 scale. The sex differences, however, are scarcely large enough to be of any considerable significance.

SCATTERING IN THE UNSTABLE GROUPS

Some authorities hold that scattering is a pathognomonic sign of psychopathy, particularly if advance tests are passed in more than four years above the basal age.

Table 3 shows that the amount of advance credit earned by the delinquent, psychopathic, and neurotic groups in the 1908, 1911, and Stanford scales. The average amount of scattering for the neurotics is 0.24 year less than for all the subjects (1.02 year) in the 1908 scale; 0.01 year less than for all the subjects (1.39 year) in the 1911 scale, but 0.17 year greater than for all the subjects (1.63 year) in the Stanford scale.

An analysis of the credits earned by the delinquent cases shows that the average amount of scattering among this group was 0.17 year less than among all the subjects in the 1908 scale, but 0.04 year greater than the general average in the 1911 scale and 0.03 year greater than the general average in the Stanford scale. The differences in the latter two scales are negligible. The results for the psychopaths are similar, except that they earned more advance credits than the general average in all three scales, the difference amounting to 0.10 year in the 1908 scale, 0.03 year in the 1911 scale, and 0.27 year in the Stanford.

We have averaged the results for all the subjects included in table 3 under the general heading of unstables. Comparing the scores for the neurotics, psychopaths, and delinquents with this average we find that the neurotics earned 0.07 year less than the combined group of unstables in the 1908 scale, 0.04 year less in the 1911 scale, but 0.07 year more in the Stanford. The average for the psychopaths exceeded the average for all the unstables by 0.28 year in the 1908 scale, and by 0.18 year in the Stanford, while the figures were the same in the 1911 scale. The amount of scattering for the delinquents was the same as that for all the unstables in the 1908 scale, exceeded the unstables by 0.02 year in the 1911 scale, and fell short of the unstables by 0.06 year in the Stanford. The differences are negligible except for the psychopaths.

If we direct our attention to the extreme variants, those earning eleven or more advance credits, we find that for the 1908 scale 7.7 per cent of all the subjects passed eleven or more tests above the base (Table II, Journal of Educational Psychology, 1922, p. 143), while only 3.9 per cent of the delinquent group passed that number (table 4). Hence extreme variants

TABLE 4

Percentage of unstables earning eleven or more advance points

		1908			1911			STANFORD		
		Number	Number passing	Per cent	Number	Number passing	Per cent	Number	Number passing	Per cent
Delinquents	Boys	161	4	2.41	161	28	17.39	140	78	55.71
	Girls	18	3	16.66	18	3	16.66	33	17	51.51
	Both	179	7	3.91	179	31	17.31	173	95	54.91
Psychopaths	Boys	4	0	0	4	1	25.00	13	7	54.91
	Girls	3	1	33.33	3	2	66.00	2	1	50.00
	Both	7	1	14.28	7	3	42.85	15	8	53.33
Neurotics	Boys	25	0	0	25	5	20.00	92	51	55.43
	Girls	8	0	0	8	2	25.00	30	8	26.66
	Both	33	0	0	33	7	21.21	122	59	48.36
Total Unstable	Boys	190	4	2.10	190	34	17.89	245	136	55.51
	Girls	29	4	13.79	29	7	24.13	65	26	40.00
	Both	219	8	3.65	219	41	18.72	310	162	52.25

were 3.8 per cent less frequent among the delinquents than among all the subjects in the 1908 scale. On the other hand, the percentage of delinquents who passed eleven or more advance tests in the 1911 and Stanford scales was 4.8 and 15.2 per cent greater, respectively, than the percentage for the whole group.

Comparing the scores of the psychopaths in the same way,

we find that the percentage of this group passing more than ten advance tests was greater than the percentage of all the subjects by 6.5 per cent in the 1908 scale, by 30.3 per cent in the 1911 scale, and by 13.6 per cent in the Stanford.

In the neurotic group the percentage of subjects who passed eleven or more advance tests was 7.7 per cent less than the percentage for all the subjects in the 1908 scale, but 9 per cent greater in the 1911 scale, and 8.6 per cent greater in the Stanford,

A comparison of the figures for the delinquents, psychopaths, and neurotics with those for the limited and combined normal groups has already been published.[7]

The proportion of the "total unstable" group earning eleven or more advance credits (table 4) varies strikingly in the three scales. In the 1908 scale, 3.65 per cent of the unstables earned eleven or more advance credits; in the 1911 scale, 18.72 per cent; and in the Stanford scale, 52.25 per cent. The per cent of psychopathics earning eleven or more advance credits exceeded the per cent of the total unstable group earning such credits by 10.63 per cent in the 1908 scale, by 24.13 per cent in the 1911 scale, and by 1.08 per cent in the Stanford scale. Little consistency is shown in the other groups. The percentage for the deliquents exceeded the total unstable group by 0.26 per cent in the 1908 scale, and by 2.66 per cent in the Stanford, but was 1.41 per cent less in the 1911 scale. The per cent of neurotics earning eleven or more advance credits was less by 3.65 per cent than for the total unstable group in the 1908 scale, more by 2.49 per cent in the 1911, and less by 3.89 per cent in the Stanford.

In general the results indicate that the unstable groups scatter slightly more than the average. This is true more particularly for the psychopaths who scatter more than the general average in all three scales. They also exceed the other unstable groups, earning 2.89 months more advance credits than the delinquent group, 1.30 months more than the neurotic group, and 2.13 months more than the average for the total unstable group.

[7] Journal of Educational Psychology, 1922, 147–150.

It does not appear, however, that the psychopaths earn so many more advance credits than any other type of individual that scattering in the Binet scale can be considered a pathognomonic sign of psychopathy. It is, at best, a suspicious symptom.

SEX DIFFERENCES AMONG UNSTABLES

If we compare the difference in scattering between the boys and the girls in the unstable groups, we find that the boys scatter more than the girls in every classification except the psychopathic group in the 1911 scale, in which the girls exceed the boys by 4.9 months. In the 1908 scale the girls exceed the boys in every classification except the neurotic group, where the boys earn 2.6 months more than the girls. In the Stanford scale, the boys scatter more than the girls in every group. The same general tendencies appear here that were noted before in comparing the sexes for the total group of cases.

CONCLUSIONS

All of the investigations we have made of "scattering" in the Binet scale have yielded fairly consistent results so far as affects the major issues. We have found nothing, so far as scattering in the Binet scale is concerned, to confirm the statement of Binet and Simon that inequality of mental development is the specific characteristic of the feeble-minded, nor the statement of Doll[8] that the feeble-minded child "obtains his points of credit from a greater range of tests than does the normal child of the same intelligence level." Nor have we been able to discover that scattering, or the ability to earn advance credits, is a pathognomonic sign of potential feeble-mindedness. Our findings seem to be in harmony with the conclusion of Mathews[9] that a "comparison of I.Q. with irreg-

[8] Doll, E. A. Preliminary Note on the Diagnosis of Potential Feeble-mindedness, Training School Bulletin, 1916. Scattering in the Binet-Simon Tests, Training School Bulletin, 1919, 96ff.

[9] Mathews, Julia. Irregularity in Intelligence Tests of Delinquents, Journal of Delinquency, 1921, 355ff.

ularity shows a rather stronger tendency than has yet been found toward greater scattering among the higher I.Q's." While we have not thus far analyzed our data for various I.Q. groups, our descending diagnostic intelligence groups correspond broadly to descending I.Q. groups.

That the normal children earn more advance credits than the feeble-minded of any grade, and particularly the feeble-minded of the lower grades, appears consistently in all our investigations with the 1911 and the Stanford-Binet scales. We do not believe that the validity of this conclusion is upset by the fact that the scattering in the 1908 scale is least among the normals, because of the limitations of the scale and the high rating of the normals on the scale, to which reference has already been made.

No very definite conclusions can be drawn from our data regarding the relation of scattering to sex. In the 1911 and Stanford scales the boys are somewhat more variable than the girls. This may be considered a slight confirmation of the conclusion that the male sex varies more than the female.

The unstable group as a whole, which includes the delinquent, psychopathic, and neurotic groups, slightly exceeds the general average in the amount of scattering. Of the three unstable groups the psychopaths tend to scatter most. But we are not prepared to conclude that this is a pathognomonic sign of psychopathy. It is no doubt true that many individuals who are clearly recognized as unstable, neurotic, or psychopathic do scatter widely. On the other hand, many unstables give very uniform results, while others who show no evidence of instability or psychopathy, but who appear to be normal in emotional make-up, and normal or slightly subnormal in intellectual capacity, may display great irregularity in the Binet scale.

During the last few years the writer has examined about a score of children who had previously been pronounced psychopaths by a clinic specializing on psychopathy. The majority of these children, however, did not scatter more than the run-of-the-mine of our clinic cases, and many scattered less. The following case is typical.

On being examined at the age of 9.3, R. D. had a Vineland-Binet age of 7.6 and an I.Q. of 0.81, and was diagnosed as a psychopathic potential mental defective, because he had a "range of tests bordering on psychopathy with a distribution which is quite significant of psychopathy and a quality of work done which is also suggestive of psychopathy." He is "no doubt deteriorating, which means that a recommendation in two or three years from now will reveal a feeble-minded child." "He should be assigned to a special class." None of the predictions were, however, revealed when he was examined two years later (age 11) in the writer's clinic. At that time his I.Q. was practically the same (0.80), although tested by the Stanford-Binet which gives lower ratings than the Vineland 1911 revision. His rate of progress had been such that he had clearly maintained his intellectual rank. Instead of scattering more, he scattered less than normal. He earned 1.08 years of advance credit as compared with an average of 1.6 years for a block of 1025 of our consecutive clinic cases, 1.7 years for our combined group of normals (normal, retarded and backward) and 1.9 years for our psychopaths. Observation of his emotional and temperamental characteristics and investigation of his behavioristic record did not confirm the diagnosis of psychopathy. The school report indicated that he was "generally happy," "very kind to people," "has no conduct disorders, either in school or at home," but is "subject to fears," and "does not like to study," although he is interested in manual work and arithmetic. He was diagnosed as a very backward pupil with special disability in reading, and assigned to an ungraded class for the backward instead of a special class for mentally deficient. We are reluctant to accept the verdict of "psychopath" from hypothetical test criteria in the face of contradictory evidence of a behavioristic nature.

A PARTIAL CORRELATION SCHEMA

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Huffaker[1] developed a schema which reduces the number of computations involved in solving problems in partial and multiple correlation of three, four, five, and six variable magnitudes. In his article Huffaker refers to the methods worked out by Kelley and Rosenow of shortening the labor involved in partial and multiple correlation. These methods, however, have not been applied to variable magnitudes above six.

The writer has devised a schema for solving problems in partial and multiple correlation of the seven and eight variable magnitudes which involves the finding of fewer partial coefficients than any other plan as yet proposed. This plan is a modification and an extension of Huffaker's schema.

According to Yule's method the computation of 315 partial coefficients is necessary in solving a problem involving seven variables and 588 partial coefficients are necessary in solving a problem of eight variables. According to this schema it is necessary to compute 83 partial coefficients in solving a problem involving seven variables and 129 partial coefficients in solving a problem of eight variables.

In the outline of the plan below it is assumed that the reader has a working knowledge of the theory of correlation and of the customary notations used in partial correlation. The notations used throughout this schema are those given by Yule.

In general, the problem before us is the same as that stated by Huffaker and Rosenow, viz., given a dependent variable and a number of independent variables how can the maximum of information be obtained with the minimum of arithmetic?

[1] Huffaker, C. L.: A contribution to the technique of partial correlation. Journal Applied Psychology, 1923, 7, 135–142.

This problem involves two stages: (1) The finding of all the partial coefficients of correlation of all orders necessary for finding the coefficients of the highest order with reference to the dependent variable and (2) the finding of the regression coefficients or weights for estimating the dependent variable.

In a problem involving seven variables, the tables given below include all the partial coefficients of correlation of all orders needed for finding the partial coefficients of the highest order with reference to the dependent variable. The successive steps to be taken in solving the problem are listed in the order which will result in the greatest economy of time and labor.

First Order Coefficients	*May be obtained from Zero Order Coefficients*		
$r_{13.7}$	r_{12}	r_{17}	r_{27}
$r_{13.2}$	r_{13}	r_{12}	r_{23}
$r_{13.7}$	r_{13}	r_{17}	r_{37}
$r_{14.2}$	r_{14}	r_{12}	r_{24}
$r_{14.7}$	r_{14}	r_{17}	r_{47}
$r_{15.2}$	r_{15}	r_{12}	r_{25}
$r_{15.7}$	r_{15}	r_{17}	r_{57}
$r_{16.2}$	r_{16}	r_{12}	r_{26}
$r_{16.7}$	r_{16}	r_{17}	r_{67}
$r_{17.2}$	r_{17}	r_{12}	r_{27}
$r_{23.7}$	r_{23}	r_{27}	r_{37}
$r_{24.7}$	r_{24}	r_{27}	r_{47}
$r_{25.7}$	r_{25}	r_{27}	r_{57}
$r_{26.7}$	r_{26}	r_{27}	r_{67}
$r_{34.2}$	r_{24}	r_{23}	r_{34}
$r_{34.7}$	r_{34}	r_{37}	r_{47}
$r_{35.2}$	r_{35}	r_{23}	r_{35}
$r_{35.7}$	r_{35}	r_{37}	r_{57}
$r_{36.2}$	r_{36}	r_{23}	r_{36}
$r_{36.7}$	r_{36}	r_{37}	r_{67}
$r_{37.2}$	r_{37}	r_{23}	r_{27}
$r_{45.2}$	r_{45}	r_{24}	r_{25}
$r_{45.7}$	r_{45}	r_{47}	r_{57}
$r_{46.2}$	r_{46}	r_{24}	r_{26}
$r_{46.7}$	r_{46}	r_{47}	r_{67}
$r_{47.2}$	r_{47}	r_{24}	r_{27}
$r_{56.2}$	r_{56}	r_{25}	r_{26}
$r_{56.7}$	r_{56}	r_{57}	r_{67}
$r_{57.2}$	r_{57}	r_{25}	r_{27}
$r_{67.2}$	r_{67}	r_{26}	r_{27}

Second Order Coefficients needed	*May be obtained from First Order Coefficients*		
$r_{12.67}$	$r_{12.7}$	$r_{16.7}$	$r_{26.7}$
$r_{13.67}$	$r_{13.7}$	$r_{16.7}$	$r_{36.7}$
$r_{14.23}$	$r_{14.2}$	$r_{13.2}$	$r_{34.2}$
$r_{14.67}$	$r_{14.7}$	$r_{16.7}$	$r_{46.7}$
$r_{15.23}$	$r_{15.2}$	$r_{13.2}$	$r_{35.2}$
$r_{15.67}$	$r_{15.7}$	$r_{16.7}$	$r_{56.7}$
$r_{16.23}$	$r_{16.2}$	$r_{13.2}$	$r_{36.2}$
$r_{17.23}$	$r_{17.2}$	$r_{13.2}$	$r_{37.2}$
$r_{23.67}$	$r_{23.7}$	$r_{26.7}$	$r_{36.7}$
$r_{24.67}$	$r_{24.7}$	$r_{26.7}$	$r_{46.7}$
$r_{25.67}$	$r_{25.7}$	$r_{26.7}$	$r_{56.7}$
$r_{34.67}$	$r_{34.7}$	$r_{36.7}$	$r_{46.7}$
$r_{35.67}$	$r_{35.7}$	$r_{36.7}$	$r_{56.7}$
$r_{45.23}$	$r_{45.2}$	$r_{34.2}$	$r_{35.2}$
$r_{45.67}$	$r_{45.7}$	$r_{46.7}$	$r_{56.7}$
$r_{46.23}$	$r_{46.2}$	$r_{34.2}$	$r_{36.2}$
$r_{47.23}$	$r_{47.2}$	$r_{34.2}$	$r_{37.2}$
$r_{56.23}$	$r_{56.2}$	$r_{35.2}$	$r_{36.2}$
$r_{57.23}$	$r_{57.2}$	$r_{35.2}$	$r_{37.2}$
$r_{67.23}$	$r_{67.2}$	$r_{36.2}$	$r_{37.2}$

Third Order Coefficients needed	*May be obtained from Second Order Coefficients*		
$r_{12.567}$	$r_{12.67}$	$r_{15.67}$	$r_{25.67}$
$r_{13.567}$	$r_{13.67}$	$r_{15.67}$	$r_{35.67}$
$r_{14.567}$	$r_{14.67}$	$r_{15.67}$	$r_{45.67}$
$r_{15.234}$	$r_{15.23}$	$r_{14.23}$	$r_{45.23}$
$r_{16.234}$	$r_{16.23}$	$r_{14.23}$	$r_{46.23}$
$r_{17.234}$	$r_{17.23}$	$r_{14.23}$	$r_{47.23}$
$r_{23.567}$	$r_{23.67}$	$r_{25.67}$	$r_{35.67}$
$r_{24.567}$	$r_{24.67}$	$r_{25.67}$	$r_{45.67}$
$r_{24.367}$	$r_{24.67}$	$r_{23.67}$	$r_{34.67}$
$r_{25.367}$	$r_{25.67}$	$r_{23.67}$	$r_{35.67}$
$r_{34.567}$	$r_{34.67}$	$r_{35.67}$	$r_{45.67}$
$r_{45.367}$	$r_{45.67}$	$r_{34.67}$	$r_{35.67}$
$r_{56.234}$	$r_{56.23}$	$r_{45.23}$	$r_{46.23}$
$r_{57.234}$	$r_{57.23}$	$r_{45.23}$	$r_{47.23}$
$r_{67.234}$	$r_{67.23}$	$r_{46.23}$	$r_{47.23}$

Fourth Order Coefficients needed	*May be obtained from Third Order Coefficients*		
$r_{12.4567}$	$r_{12.567}$	$r_{14.567}$	$r_{24.567}$
$r_{13.4567}$	$r_{13.567}$	$r_{14.567}$	$r_{34.567}$
$r_{14.2367}$	$r_{14.367}$	$r_{12.367}$	$r_{24.367}$
$r_{15.2367}$	$r_{15.367}$	$r_{12.367}$	$r_{25.367}$
$r_{16.2345}$	$r_{16.234}$	$r_{15.234}$	$r_{56.234}$
$r_{17.2345}$	$r_{17.234}$	$r_{15.234}$	$r_{57.234}$
$r_{23.4567}$	$r_{23.567}$	$r_{24.567}$	$r_{34.567}$
$r_{45.2367}$	$r_{45.367}$	$r_{24.367}$	$r_{25.367}$
$r_{67.2345}$	$r_{67.234}$	$r_{56.234}$	$r_{57.234}$

Fifth Order Coefficients needed	*May be obtained from Fourth Order Coefficients*		
$r_{12.34567}$	$r_{12.4567}$	$r_{13.4567}$	$r_{23.4567}$
$r_{13.24567}$	$r_{13.4567}$	$r_{12.4567}$	$r_{23.4567}$
$r_{14.23567}$	$r_{14.2367}$	$r_{15.2367}$	$r_{45.2367}$
$r_{15.23467}$	$r_{15.2367}$	$r_{14.2367}$	$r_{45.2367}$
$r_{16.23457}$	$r_{16.2345}$	$r_{17.2345}$	$r_{67.2345}$
$r_{17.23456}$	$r_{17.2345}$	$r_{16.2345}$	$r_{67.2345}$

To check the arithmetic of the above operations, the multiple R may be found in two different ways as follows:

$$1 - R^2_{1.234567} = (1 - r^2_{12})\ (1 - r^2_{13.2})\ (1 - r^2_{14.23})\ (1 - r^2_{15.234})$$
$$(1 - r^2_{16.2345})\ (1 - r^2_{17.23456})$$

$$1 - R^2_{1.234567} = (1 - r^2_{17})\ (1 - r^2_{16.7})\ (1 - r^2_{15.67})\ (1 - r^2_{14.567})$$
$$(1 - r^2_{13.4567})\ (1 - r^2_{12.34567})$$

In addition to the partial coefficients given above, seven standard deviations of the type $S.D._{1,234567}$ are needed. In securing these standard deviations it is necessary to select formulae which occur in the tables of partial correlations given above. This can be done only by careful analysis of the formulae required to secure the desired standard deviations. The three different ways of selecting formulae for standard deviations of this type suggested by Huffaker in the article referred to cannot be applied in securing all of the seven standard deviations needed. The formulae selected are as follows:

$$S.D._{.1.234567} = S.D._{.1}\sqrt{1-r^2_{17}}\sqrt{1-r^2_{16.7}}\sqrt{1-r^2_{15.67}}$$
$$\sqrt{1-r^2_{14.567}}\sqrt{1-r^2_{13.4567}}\sqrt{1-r^2_{12.34567}}$$

$$S.D._{.2.134567} = S.D._{.2}\sqrt{1-r^2_{27}}\sqrt{1-r^2_{26.7}}\sqrt{1-r^2_{25.67}}\sqrt{1-r^2_{24.567}}$$
$$\sqrt{1-r^2_{23.4567}}\sqrt{1-r^2_{12.34567}}$$

$$S.D._{.3.124567} = S.D._{.3}\sqrt{1-r^2_{37}}\sqrt{1-r^2_{36.7}}\sqrt{1-r^2_{35.67}}\sqrt{1-r^2_{34.567}}$$
$$\sqrt{1-r^2_{23.4567}}\sqrt{1-r^2_{13.34567}}$$

$$S.D._{.4.123567} = S.D._{.4}\sqrt{1-r^2_{47}}\sqrt{1-r^2_{46.7}}\sqrt{1-r^2_{45.67}}\sqrt{1-r^2_{34.567}}$$
$$\sqrt{1-r^2_{45.2367}}\sqrt{1-r^2_{14.23567}}$$

$$S.D._{.5.123467} = S.D._{.5}\sqrt{1-r^2_{57}}\sqrt{1-r^2_{56.7}}\sqrt{1-r^2_{55.67}}$$
$$\sqrt{1-r^2_{25.367}}\sqrt{1-r^2_{45.2367}}\sqrt{1-r^2_{15.23467}}$$

$$S.D._{.6.123457} = S.D._{.6}\sqrt{1-r^2_{26}}\sqrt{1-r^2_{26.2}}\sqrt{1-r^2_{46.23}}\sqrt{1-r^2_{56.234}}$$
$$\sqrt{1-r^2_{67.2345}}\sqrt{1-r^2_{16.23457}}$$

$$S.D._{.7.123456} = S.D._{.7}\sqrt{1-r^2_{27}}\sqrt{1-r^2_{37.2}}\sqrt{1-r^2_{47.23}}\sqrt{1-r^2_{57.234}}$$
$$\sqrt{1-r^2_{67.2345}}\sqrt{1-r^2_{17.23456}}$$

The b values in the regression equation are given by the general formula

$$b_{12.34\ldots n} = r_{12.34\ldots n}\frac{S.D._{.1.234\ldots n}}{S.D._{.2.134\ldots n}}$$

Thus for example the value of $b_{12.34567}$ is given by the formula

$$b_{12.34567} = r_{12.34567}\frac{S.D._{.1.234567}}{S.D._{.2.134567}}$$

The regression equation for estimating the dependent variable is,

$$\bar{x}_1 = b_{12.34567}x_2 + b_{13.24567}x_3 + b_{14.23567}x_4 + b_{15.23467}x_5 + b_{16.23457}x_6 + b_{17.23456}x_7$$

In this equation $\bar{x}_1$ is the estimated deviation from the mean of the dependent variable, 1; x_2 is the observed deviation from the mean of variable 2, etc.

The plan for eight variables is given below. It involves the same procedure and is subject to the same checks as the above plan for seven variables.

First Order Coefficients needed	*May be Obtained from Zero Order Coefficients*		
$r_{12.3}$	r_{13}	r_{18}	r_{23}
$r_{13.2}$	r_{13}	r_{12}	r_{23}
$r_{13.8}$	r_{13}	r_{18}	r_{38}
$r_{14.2}$	r_{14}	r_{12}	r_{24}
$r_{14.3}$	r_{14}	r_{13}	r_{43}
$r_{15.2}$	r_{15}	r_{12}	r_{25}
$r_{15.3}$	r_{15}	r_{13}	r_{53}
$r_{16.2}$	r_{16}	r_{12}	r_{26}
$r_{16.3}$	r_{16}	r_{13}	r_{63}
$r_{17.2}$	r_{17}	r_{12}	r_{27}
$r_{17.3}$	r_{17}	r_{13}	r_{73}
$r_{18.2}$	r_{18}	r_{12}	r_{28}
$r_{23.8}$	r_{23}	r_{28}	r_{38}
$r_{24.3}$	r_{24}	r_{23}	r_{43}
$r_{25.3}$	r_{25}	r_{23}	r_{53}
$r_{26.3}$	r_{26}	r_{23}	r_{63}
$r_{27.3}$	r_{27}	r_{23}	r_{73}
$r_{34.2}$	r_{34}	r_{23}	r_{24}
$r_{34.8}$	r_{34}	r_{38}	r_{43}
$r_{35.2}$	r_{35}	r_{23}	r_{25}
$r_{35.8}$	r_{35}	r_{38}	r_{53}
$r_{36.2}$	r_{36}	r_{23}	r_{26}
$r_{36.8}$	r_{36}	r_{38}	r_{63}
$r_{37.2}$	r_{37}	r_{23}	r_{27}
$r_{37.8}$	r_{37}	r_{38}	r_{73}
$r_{38.2}$	r_{38}	r_{23}	r_{28}
$r_{45.2}$	r_{45}	r_{24}	r_{25}
$r_{45.8}$	r_{45}	r_{43}	r_{53}
$r_{46.2}$	r_{46}	r_{24}	r_{26}
$r_{46.8}$	r_{46}	r_{43}	r_{63}
$r_{47.2}$	r_{47}	r_{24}	r_{27}
$r_{47.3}$	r_{47}	r_{43}	r_{73}
$r_{48.2}$	r_{48}	r_{24}	r_{28}
$r_{56.2}$	r_{56}	r_{25}	r_{26}

First Order Coefficients needed	*May be Obtained from Zero Order Coefficients*		
$r_{56.8}$	r_{58}	r_{68}	r_{68}
$r_{57.2}$	r_{57}	r_{25}	r_{27}
$r_{57.8}$	r_{57}	r_{58}	r_{78}
$r_{58.2}$	r_{58}	r_{28}	r_{28}
$r_{67.2}$	r_{67}	r_{26}	r_{27}
$r_{67.8}$	r_{67}	r_{68}	r_{78}
$r_{68.2}$	r_{68}	r_{26}	r_{28}
$r_{78.2}$	r_{78}	r_{27}	r_{28}

Second Order Coefficients needed	*May be Obtained from First Order Coefficients*		
$r_{13.78}$	$r_{12.8}$	$r_{17.8}$	$r_{27.8}$
$r_{13.78}$	$r_{13.8}$	$r_{17.8}$	$r_{37.8}$
$r_{14.23}$	$r_{14.2}$	$r_{13.2}$	$r_{34.2}$
$r_{14.78}$	$r_{14.8}$	$r_{17.8}$	$r_{47.8}$
$r_{15.23}$	$r_{15.2}$	$r_{13.2}$	$r_{35.2}$
$r_{15.78}$	$r_{15.8}$	$r_{17.8}$	$r_{57.8}$
$r_{16.23}$	$r_{16.2}$	$r_{13.2}$	$r_{36.2}$
$r_{16.78}$	$r_{16.8}$	$r_{17.8}$	$r_{67.8}$
$r_{17.23}$	$r_{17.2}$	$r_{13.2}$	$r_{37.2}$
$r_{18.23}$	$r_{18.2}$	$r_{13.2}$	$r_{38.2}$
$r_{23.78}$	$r_{23.8}$	$r_{27.8}$	$r_{37.8}$
$r_{24.78}$	$r_{24.8}$	$r_{27.8}$	$r_{47.8}$
$r_{25.78}$	$r_{25.8}$	$r_{27.8}$	$r_{57.8}$
$r_{26.78}$	$r_{26.8}$	$r_{27.8}$	$r_{67.8}$
$r_{34.78}$	$r_{34.8}$	$r_{27.8}$	$r_{47.8}$
$r_{35.78}$	$r_{35.8}$	$r_{27.8}$	$r_{57.8}$
$r_{36.78}$	$r_{36.8}$	$r_{27.8}$	$r_{67.8}$
$r_{45.23}$	$r_{45.2}$	$r_{34.2}$	$r_{35.2}$
$r_{45.78}$	$r_{45.8}$	$r_{47.8}$	$r_{57.8}$
$r_{46.23}$	$r_{46.2}$	$r_{34.2}$	$r_{36.2}$
$r_{46.78}$	$r_{46.8}$	$r_{47.8}$	$r_{67.8}$
$r_{47.23}$	$r_{47.2}$	$r_{34.2}$	$r_{37.2}$
$r_{48.23}$	$r_{48.2}$	$r_{34.2}$	$r_{38.2}$
$r_{56.23}$	$r_{56.2}$	$r_{35.2}$	$r_{36.2}$
$r_{56.78}$	$r_{56.8}$	$r_{57.8}$	$r_{67.8}$
$r_{57.23}$	$r_{57.2}$	$r_{35.2}$	$r_{37.2}$
$r_{58.23}$	$r_{58.2}$	$r_{35.2}$	$r_{38.2}$
$r_{67.23}$	$r_{67.2}$	$r_{36.2}$	$r_{37.2}$
$r_{68.23}$	$r_{68.2}$	$r_{36.2}$	$r_{38.2}$
$r_{78.23}$	$r_{78.2}$	$r_{37.2}$	$r_{38.2}$

Third Order Coefficients needed	*May be Obtained from Second Order Coefficients*		
$\tau_{13.678}$	$\tau_{13.78}$	$\tau_{16.78}$	$\tau_{36.78}$
$\tau_{13.678}$	$\tau_{13.78}$	$\tau_{16.78}$	$\tau_{36.78}$
$\tau_{14.678}$	$\tau_{14.78}$	$\tau_{16.78}$	$\tau_{46.78}$
$\tau_{15.234}$	$\tau_{15.23}$	$\tau_{14.23}$	$\tau_{45.23}$
$\tau_{15.678}$	$\tau_{15.78}$	$\tau_{16.78}$	$\tau_{56.78}$
$\tau_{16.234}$	$\tau_{16.23}$	$\tau_{14.23}$	$\tau_{46.23}$
$\tau_{17.234}$	$\tau_{17.23}$	$\tau_{14.23}$	$\tau_{47.23}$
$\tau_{18.234}$	$\tau_{18.23}$	$\tau_{14.23}$	$\tau_{48.23}$
$\tau_{23.678}$	$\tau_{23.78}$	$\tau_{26.78}$	$\tau_{36.78}$
$\tau_{24.678}$	$\tau_{24.78}$	$\tau_{26.78}$	$\tau_{46.78}$
$\tau_{25.678}$	$\tau_{25.78}$	$\tau_{26.78}$	$\tau_{56.78}$
$\tau_{34.678}$	$\tau_{34.78}$	$\tau_{36.78}$	$\tau_{46.78}$
$\tau_{35.678}$	$\tau_{35.78}$	$\tau_{36.78}$	$\tau_{56.78}$
$\tau_{45.678}$	$\tau_{45.78}$	$\tau_{46.78}$	$\tau_{56.78}$
$\tau_{56.234}$	$\tau_{56.23}$	$\tau_{45.23}$	$\tau_{46.23}$
$\tau_{57.234}$	$\tau_{57.23}$	$\tau_{45.23}$	$\tau_{47.23}$
$\tau_{58.234}$	$\tau_{58.23}$	$\tau_{45.23}$	$\tau_{48.23}$
$\tau_{67.234}$	$\tau_{67.23}$	$\tau_{46.23}$	$\tau_{47.23}$
$\tau_{68.234}$	$\tau_{68.23}$	$\tau_{46.23}$	$\tau_{48.23}$
$\tau_{78.234}$	$\tau_{78.23}$	$\tau_{47.23}$	$\tau_{48.23}$

Fourth Order Coefficients needed	*May be obtained from Third Order Coefficients*		
$\tau_{12.5678}$	$\tau_{12.678}$	$\tau_{15.678}$	$\tau_{25.678}$
$\tau_{13.5678}$	$\tau_{13.678}$	$\tau_{15.678}$	$\tau_{35.678}$
$\tau_{14.5678}$	$\tau_{14.678}$	$\tau_{15.678}$	$\tau_{45.678}$
$\tau_{15.2347}$	$\tau_{15.234}$	$\tau_{17.234}$	$\tau_{57.234}$
$\tau_{16.2345}$	$\tau_{16.234}$	$\tau_{15.234}$	$\tau_{56.234}$
$\tau_{16.2347}$	$\tau_{16.234}$	$\tau_{17.234}$	$\tau_{67.234}$
$\tau_{17.2345}$	$\tau_{17.234}$	$\tau_{15.234}$	$\tau_{57.234}$
$\tau_{18.2345}$	$\tau_{18.234}$	$\tau_{15.234}$	$\tau_{58.234}$
$\tau_{18.2347}$	$\tau_{18.234}$	$\tau_{17.234}$	$\tau_{78.234}$
$\tau_{23.5678}$	$\tau_{23.678}$	$\tau_{25.678}$	$\tau_{35.678}$
$\tau_{24.5678}$	$\tau_{24.678}$	$\tau_{25.678}$	$\tau_{45.678}$
$\tau_{34.5678}$	$\tau_{34.678}$	$\tau_{35.678}$	$\tau_{45.678}$
$\tau_{56.2347}$	$\tau_{56.234}$	$\tau_{57.234}$	$\tau_{67.234}$
$\tau_{58.2347}$	$\tau_{58.234}$	$\tau_{57.234}$	$\tau_{78.234}$
$\tau_{67.2345}$	$\tau_{67.234}$	$\tau_{56.234}$	$\tau_{57.234}$
$\tau_{68.2345}$	$\tau_{68.234}$	$\tau_{56.234}$	$\tau_{58.234}$
$\tau_{68.2347}$	$\tau_{68.234}$	$\tau_{67.234}$	$\tau_{78.234}$
$\tau_{78.2345}$	$\tau_{78.234}$	$\tau_{57.234}$	$\tau_{58.234}$

Fifth Order Coefficients needed	*May be obtained from Fourth Order Coefficients*		
$r_{12.35678}$	$r_{12.5678}$	$r_{13.5678}$	$r_{23.5678}$
$r_{12.45678}$	$r_{12.5678}$	$r_{14.5678}$	$r_{24.5678}$
$r_{13.45678}$	$r_{13.5678}$	$r_{14.5678}$	$r_{34.5678}$
$r_{14.35678}$	$r_{14.5678}$	$r_{13.5678}$	$r_{34.5678}$
$r_{15.23478}$	$r_{15.2347}$	$r_{18.2347}$	$r_{58.2347}$
$r_{16.23478}$	$r_{16.2347}$	$r_{18.2347}$	$r_{68.2347}$
$r_{17.23456}$	$r_{17.2345}$	$r_{16.2345}$	$r_{67.2345}$
$r_{18.23456}$	$r_{18.2345}$	$r_{16.2345}$	$r_{68.2345}$
$r_{23.45678}$	$r_{23.5678}$	$r_{24.5678}$	$r_{34.5678}$
$r_{24.35678}$	$r_{24.5678}$	$r_{23.5678}$	$r_{34.5678}$
$r_{56.23478}$	$r_{56.2347}$	$r_{58.2347}$	$r_{68.2347}$
$r_{78.23456}$	$r_{78.2345}$	$r_{67.2345}$	$r_{68.2345}$

Sixth Order Coefficients needed	*May be obtained from Fifth Order Coefficients*		
$r_{12.345678}$	$r_{12.45678}$	$r_{13.45678}$	$r_{23.45678}$
$r_{13.245678}$	$r_{13.45678}$	$r_{12.45678}$	$r_{23.45678}$
$r_{14.235678}$	$r_{14.35678}$	$r_{12.35678}$	$r_{24.35678}$
$r_{15.234678}$	$r_{15.23478}$	$r_{16.23478}$	$r_{56.23478}$
$r_{16.234578}$	$r_{16.23478}$	$r_{15.23478}$	$r_{56.23478}$
$r_{17.234568}$	$r_{17.23456}$	$r_{18.23456}$	$r_{78.23456}$
$r_{18.234567}$	$r_{18.23456}$	$r_{17.23456}$	$r_{78.23456}$

The formulae for securing the two multiple R's are as follows:

$$1 - R^2_{1.2345678} = (1 - r^2_{12})\,(1 - r^2_{13.2})\,(1 - r^2_{14.23})\,(1 - r^2_{15.234})$$
$$(1 - r^2_{16.2345})\,(1 - r^2_{17.23456})\,(1 - r^2_{18.234567})$$

$$1 - R^2_{1.2345678} = (1 - r^2_{18})\,(1 - r^2_{17.8})\,(1 - r^2_{16.78})\,(1 - r^2_{15.678})$$
$$(1 - r^2_{14.5678})\,(1 - r^2_{13.45678})\,(1 - r^2_{12.345678})$$

The formulae selected for securing the eight standard deviations are as follows:

$$\text{S.D.}_{1.2345678} = \text{S.D.}_1 \sqrt{1 - r^2_{18}}\,\sqrt{1 - r^2_{17.8}}\,\sqrt{1 - r^2_{16.78}}\,\sqrt{1 - r^2_{15.678}}$$
$$\sqrt{1 - r^2_{14.5678}}\,\sqrt{1 - r^2_{13.45678}}\,\sqrt{1 - r^2_{12.345678}}$$

$$\text{S.D.}_{2.1345678} = \text{S.D.}_2 \sqrt{1 - r^2_{28}}\,\sqrt{1 - r^2_{27.8}}\,\sqrt{1 - r^2_{26.78}}\,\sqrt{1 - r^2_{25.67_8}}$$
$$\sqrt{1 - r^2_{24.5678}}\,\sqrt{1 - r^2_{23.45678}}\,\sqrt{1 - r^2_{12.345678}}$$

$$S.D._{.1.2345678} = S.D._{.1}\sqrt{1-r^2_{18}}\sqrt{1-r^2_{27.1}}\sqrt{1-r^2_{36.78}}\sqrt{1-r^2_{45.678}}$$
$$\sqrt{1-r^2_{24.5678}}\sqrt{1-r^2_{23.45678}}\sqrt{1-r^2_{13.245678}}$$

$$S.D._{.4.1235678} = S.D._{.4}\sqrt{1-r^2_{48}}\sqrt{1-r^2_{47.8}}\sqrt{1-r^2_{46.78}}\sqrt{1-r^2_{45.678}}$$
$$\sqrt{1-r^2_{34.5678}}\sqrt{1-r^2_{24.35678}}\sqrt{1-r^2_{14.235678}}$$

$$S.D._{.5.1234678} = S.D._{.5}\sqrt{1-r^2_{58}}\sqrt{1-r^2_{56.8}}\sqrt{1-r^2_{45.23}}\sqrt{1-r^2_{57.234}}$$
$$\sqrt{1-r^2_{58.2347}}\sqrt{1-r^2_{56.23478}}\sqrt{1-r^2_{15.234678}}$$

$$S.D._{.6.1234578} = S.D._{.6}\sqrt{1-r^2_{68}}\sqrt{1-r^2_{56.8}}\sqrt{1-r^2_{46.23}}\sqrt{1-r^2_{67.234}}$$
$$\sqrt{1-r^2_{68.2347}}\sqrt{1-r^2_{56.23478}}\sqrt{1-r^2_{16.234678}}$$

$$S.D._{.7.1234689} = S.D._{.7}\sqrt{1-r^2_{27}}\sqrt{1-r^2_{37.2}}\sqrt{1-r^2_{47.23}}\sqrt{1-r^2_{67.234}}$$
$$\sqrt{1-r^2_{67.2345}}\sqrt{1-r^2_{78.23456}}\sqrt{1-r^2_{17.234568}}$$

$$S.D._{.8.1234567} = S.D._{.8}\sqrt{1-r^2_{28}}\sqrt{1-r^2_{38.2}}\sqrt{1-r^2_{48.23}}\sqrt{1-r^2_{58.234}}$$
$$\sqrt{1-r^2_{68.2345}}\sqrt{1-r^2_{78.23456}}\sqrt{1-r^2_{18.234567}}$$

The formulae for the b's are:

$$b_{12.345678} = r_{12.345678}\frac{S.D._{.1.2345678}}{S.D._{.2.1345678}}$$

$$b_{13.245678} = r_{13.245678}\frac{S.D._{.1.2345678}}{S.D._{.3.1245678}}$$

etc.

It will be noted that the formulae for the standard deviations in both variable magnitudes have been arranged so as to eliminate the necessity of squaring the standard deviation on each side of the equation. The values for the formulae for securing the standard deviations may be readily obtained from Miner's tables.[2] It is possible to solve a problem involving seven variables correct to three places in four and one-half hours, after the Zero Order Coefficients have been computed, with the aid of Miner's tables and a calculating machine.

[2] Miner, J. R.: Tables of $1-r^2$ and $\sqrt{1-r^2}$. Johns Hopkins Press, 1922.

NOTES AND NEWS

Dr. June E. Downey is on leave travelling in Italy, France, Germany and England during the spring and summer quarters. During her absence, Richard S. Uhrbrock is Acting Head of the Department of Psychology at the University of Wyoming.

Dr. Horace B. English, of the Department of Psychology of Wesleyan University, Middletown, Conn., will return to a similar position formerly held by him at Antioch College, Yellow Springs, Ohio. Dr. English has just mailed to some of his colleagues a tentative edition, of which criticism is invited, of "A Students Dictionary of Psychological Terms."

Professor Amos C. Anderson, Department of Psychology, Ohio University, has been granted a year's leave of absence for study on his doctor's degree at Yale.

The Psychological Clinic of the Cleveland Public Schools includes in its personnel for this year the following persons: Drs. Jeannette Reamer, Mildred Baxter and Frances Lowell; Leonard Muntz and Rosina Brown, M.A.; Misses Harriet Rockwell, Janet Matthews and Claire Walters. Miss Rockwell is engaged in a study of the achievement standards of kindergarten children.

Dr. E. M. Ligon, Instructor and Laboratory Assistant at Yale University, has accepted an appointment as Assistant Professor of Psychology, Connecticut College, New London, Conn.

Dr. D. A. Worcester, Department of Psychology, Ohio University, has recently accepted a position in the University of Nebraska as Associate Professor in the Department of Educational Psychology and Measurements.

Professor John R. Gentry, Department of Psychology, Ohio University, has been granted a year's leave of absence for further study on his doctorate at Harvard University.

"Motion picture theaters are too dark," Guy A. Henry, of New York, General-Director of the Eye Sight Conservation Council of America, declared in a recent statement. "People are unnecessarily subjected to

eye strain," he asserted, "in poorly lighted auditoriums." Investigations reveal that managers of motion picture theaters have no method of determining the effectiveness of the lighting, said Mr. Henry, who urged the framing of a special code of illumination for motion picture auditoriums, following a scientific study of the problem. He believes that this is too important a matter to be left to the judgment of individuals.

The establishment of the William Allen Neilson chair of research has been announced recently at Smith College. The chair is the gift of friends and admirers of Dr. Neilson in honor of the tenth year of his presidency of Smith. It was presented by Mr. George Bliss McCallum of Northampton, a member of the Board of Trustees, speaking for the donors. The chair will be held for five years by Professor Kurt Koffka of the University of Giessen, Germany, one of the most distinguished of European psychologists, at present visiting professor at the University of Wisconsin. Professor Koffka will have at Smith a fully equipped laboratory for his research which will probably be concerned with problems of learning. He will have associated with him assistants who will conduct experiments under his direction.

The terms on which the chair is established are somewhat unusual since the holder is not only not expected to teach but is left absolutely free to study and experiment as he pleases, publishing or not as he prefers. The intention is to find the most distinguished scholar possible and to make it possible for him to work for five years under practically ideal conditions.

Professor Koffka, together with Professor Wolfgang Köhler and Professor Wertheimer of the University of Berlin, is responsible for the experiments which have led to the development of the Gestalt theory in psychology.

The Editors of "Children, The Magazine for Parents," in consultation with outstanding leaders in parental education throughout the country, have awarded the first medal to Mr. Patri as the author of "The Problems of Childhood," published by D. Appleton & Company.

Angelo Patri is the Principal of Public School No. 45 in New York City. Among his other well-known books are: "Schoolmaster in a Great City," "Home and School," and "Child Training." Mr. Patri is one of the three consultants of "Children, The Magazine for Parents," and a frequent contributor.

Although not eligible for the award because it is a compilation, the Board of Editors has voted honorable mention to "Guidance in Childhood and in Youth," compiled by Dr. Benjamin G. Gruenberg for the

Child Study Association of America, and published in 1926 by the Macmillan Company.

A gift of $400,000 has been subscribed by 364 patrons of the Lincoln School and the Trustees of Teachers College to the Lincoln School. The larger part of the sum will be used for the erection of an annex to provide much needed facilities for the rapidly expanding investigations of the Institute of Educational Research. Dr. Otis W. Caldwell, who since its establishment has been the Director of the Lincoln School, and at the same time Director of the Division of School Experimentation and under whose successful administration both the Lincoln School and the Division of School Experimentation have made such rapid strides, will devote his full time to the Lincoln Institute of School Experimentation. This institute will include the investigational work of the Lincoln School and such other studies as may later be assigned to it.

The General Education Board has given Teachers College $1,000,000 toward the endowment of the Lincoln School. The income from this sum is to be applied on the reduction of the annual allowance of $150,000, which the General Education Board has been granting to the Lincoln School.

The trustees of Teachers College announce the appointment of Dr. Jesse H. Newlon, now Superintendent of Schools in Denver, Colorado, as Director of the Lincoln School and Professor of Education in Teachers College. He will assume his office on September 1, 1927.

Dr. Newlon is a graduate of Indiana University. He received the Master's degree from Teachers College in 1914 and in 1922 the degree of LL.D. was conferred upon him by the University of Denver. He has been High School Principal in the Public Schools of Indiana and Illinois and in 1917 was elected Superintendent of Schools in Lincoln, Nebraska. Since 1920 Dr. Newlon has served as Superintendent of Schools for Denver, Colorado. In 1924–1925 he was elected President of the National Education Association. In 1925 he was awarded the Butler Silver Medal. This medal is awarded annually in silver or bronze to the graduate of Columbia University in any of its parts, who has during the year preceding shown the most competence in philosophy or in educational theory, practice, or administration. It was awarded to Dr. Newlon "in recognition of his creative work in the administration of the schools in the city of Denver, particularly his leadership in scientific study and revision of the curriculum." Dr. Newlon was the first Superintendent of Schools to be awarded this distinction.

Dr. Newlon has a national reputation as an educational administrator and one of the foremost educators in school experimentation. The re-

construction of the curriculum for the Public Schools of Denver under his direction is the most outstanding example of research work in this field.

WANTED

The Library of Congress and other institutions have requested copies of back issues of the JOURNAL OF APPLIED PSYCHOLOGY which we do not have. The editors will be glad to purchase at reasonable prices a limited number of copies. Those who have back copies for sale will please write to James P. Porter, JOURNAL OF APPLIED PSYCHOLOGY, Ohio University, Athens, Ohio.

BOOK REVIEWS

BURDETTE R. BUCKINGHAM. *Research for Teachers.* Silver, Burdett & Co., 1926. 386 pp.

The title of this book at once suggests the modern trend in education and the author's bold outlook in the field of experimental pedagogy. In it he attempts to "bring together in an accessible way some of the results of research work which the class-room teacher will find most helpful." The author has two major purposes, (1) to indicate the class-room opportunity for experimental teaching, and (2) the vital significance of the experimental attitude as an inspiration to more effective and more satisfying professional life.

In accomplishing these aims material is presented on the psychology of pedagogy, the simpler uses of statistics, the use of intelligence tests, use of educational tests, the correlation of such tests, possibilities of new type examinations, importance of classification of pupils, the significance of errors in learning, the individual child as an object of education, and the possibilities for research by teachers.

The inherent difficulties of research on the part of teachers in service will no doubt limit investigational productivity by teachers. But the endeavor to encourage class-room experiments will undoubtedly result in a gratifying improvement in professional attitude on the part of the teachers as well as an increased effectiveness in actual teaching. The mere suggestion that teachers are capable of productive research is a most significant recognition of the professional status of teaching today as a profession.

But this book does more than indicate the research possibilities of the class-room; it also supplies a background of scientific orientation and method of approach that goes far toward encouraging further experimental studies by teachers. Teachers have often been urged to adopt the experimental attitude, but they have rarely been told how to acquire it. The fund of scientific information and the simplicity of technical approach which this book affords are perhaps its greatest material contribution and add great practical stimulus to its research theme.

Education in this country, and particularly in Ohio, owes an important debt to Dr. Buckingham for the many research contributions made by himself and his co-workers in teaching service. The work of the Ohio Bureau of Educational Research has amply demonstrated that educational research pays its own way and in addition produces intangible results of great social value. We therefore regret that Dr.

Buckingham did not include one or more chapters citing specific research problems which teachers might attack, and that he did not offer one or more chapters justifying his contention that teachers are capable of worth-while investigation. Had modesty permitted, he might readily have cited from the contributions inspired from his own Bureau, and those of other states, the large number and diversity of research projects of unquestioned academic quality and scientific precision completed by teachers in the field.

A wealth of research material and research opportunity confronts every teacher. These opportunities make the academic research worker envious indeed. Perhaps this generation may yet witness an even larger public recognition of the merits of educational research. Perhaps we may even dare to hope that some day all teachers will learn the fundamental educational truth that all good teaching inevitably must be experimental.

WILLIAM H. BURNHAM. *The Normal Mind.* New York. D. Appleton & Co., 1925. Pp. 702 + xviii.

The central theme of this excellent book is mental hygiene and normal behavior. The major emphasis is on the implications of an eclectic psychology for mental health and rational conduct, the old "sound mind in a sound body" made modern by a factual or scientific approach. One admires the breadth of reading and wealth of background which the author focuses on his theme in bringing scientific psychology to the service of a problem of such great public concern and such heretofore limited scientific perspective.

The book "is concerned with the normal mind, especially with the mental health of normal children." The key to this objective is found in "integration of the personality" which makes possible the adjustment of the individual to his environment.

One of the outstanding merits is the four excellent chapters on the conditioned reflex and the successfully popular presentation of this important topic. The ample bibliography and detailed subject-matter brought together from many scattered sources are helpful to both beginners and advanced readers in psychology. The conditioned response is taken as the unit of learned reactions and the explanation of many puzzling individual habits. Parents and teachers will find these chapters instructive and helpful.

The chapters on inhibitions, attitudes, fears, and the subjective feelings involved in success and failure are likewise clear and modern. The principles of mental hygiene are stated in scientific terms and their application made obvious. There is a constructively analytical treatment of the social and educational conditions which should simplify individual adjustment.

The aims of mental hygiene are stated in positive terms as not only the prevention of abnormal mental conditions but also the development of wholesome interests and habits in all normal children and adults. One feels that the author is at times somewhat too optimistic and too enthusiastic in finding in mental hygiene almost a panacea for human problems, but this is explained by the comprehensive conception of mental hygiene of which the book as a whole constitutes a formulation.

In view of the broad scope of this book we can do no more than call attention to its aims and point of view. Our special interest in mental deficiency, however, leads us to call attention to the timely warnings contained in the chapter on "Pseudo-Feeblemindedness." The author contrasts true feeble-mindedness with those more or less remediable conditions which resemble it. Illustrative cases are cited. Our own experience, however, suggests that these are exceptional cases and that on the whole feeble-minded children are more often diagnosed as only backward than normal children as feeble-minded. The normal child will by his very success correct an occasional mistaken judgment.

The book has twenty-one chapters, each with an ample bibliography, a chapter summary and a list of problems and questions. An excellent index adds to its many other merits as an example of good publishing. A glossary of the more unusual terms to help the non-technical reader is another feature. While the literateur may object to the rather frequent repetitions, and the scientist to some lack of precision our own tendency is to ignore these in the face of the broad-mindedness, human sympathy and social vision which this work so evidently reveals.

EDGAR A. DOLL,
Vineland, N. J.

LEWIS M. TERMAN, ed. *Genetic Studies in Genius. Vol. I, Mental and Physical Traits of a Thousand Gifted Children, by* Lewis M. Terman et al. 648 pp. 1926. *Vol. II, The Early Mental Traits of Three Hundred Geniuses,* by Dr. Catharine M. Cox. 842 pp. 1926. Stanford University Press.

Studies of superior children have for the most part had to do with comparatively small groups, or with individual cases. Volume I of Genetic Studies of Genius is the first study which presents findings in regard to a large number of children of exceptional ability. The investigation was financed by a grant from the Commonwealth Fund, supplemented by funds from Stanford University, and carried out under the direction of Professor Lewis M. Terman. Its purpose is "to determine in what respects the typical gifted child differs from the typical child of normal mentality."

The principal cities of California were canvassed, and from one to five children selected from each grade on the basis of teachers' judgments

of exceptional ability, the youngest child in each grade being always ipso facto included. These cases were sifted by a group test, and the resultant group tested by an abbreviation of the Stanford-Binet test. This sifting resulted in a main experimental group of 643 subjects, with IQ's ranging from 130 to 200. (Though 140 was set as the lower limit of inclusion, 21 cases falling slightly below this were included for special reasons explained in the text.) An additional group of cases located by other means, and a group of gifted high-school students separately considered, bring the total number of cases studied to well over a thousand.

Data were collected in regard to the following items: Composition of the gifted group, racial and social origin, intellectually superior relatives, vital statistics (of the families as well as the children concerned), anthropometric measurements, health and physical history, medical examinations, school progress and educational history, tests of school accomplishment and general information, specialization of abilities, scholastic, occupational, and other interests, play interests, reading interests, intellectual, social, and activity interests, tests of character and personality traits, trait ratings, a summary of the high school group, and a follow-up of the main group after two years. Under each section methods of collection and statistical treatment of data are described in considerable detail, and the findings summarized in convenient brief form. Findings on most of the points are compared with those obtained from similar observations on a "control group" of from 600 to 800 cases. The final section briefly sums up conclusions from the study as a whole.

A follow-up of the subjects is planned, to cover a period of at least ten years. By this time at least a tentative surmise may be arrived at, in the case of the older children, as to the extent to which their early promise is being corroborated by achievement. It is earnestly to be hoped that a still later survey may be possible, to unfold still farther the story of development and achievement as related to superiority of endowment.

The publication of this volume should lay forever at rest the lingering ghosts of the old theories and superstitions regarding the disadvantages and dangers of precocity, and the relation of genius to nervousness, moral or emotional instability, mental aberration or physical defect. The findings of this study consistently indicate that mental superiority more often than not implies superiority in physical, social, moral, and emotional development as well.

Volume II of the series is an attempt to evaluate the traits which have characterized the childhood and youth of the world's great geniuses of times past. Three hundred one of the most eminent men and women of history, from the period from 1450 to 1850 were studied. The author

describes her problem thus: "How would these young geniuses of the past have tested on an intelligence scale? What mental age is indicated by the behavior or performance of a four-year-old Cuvier, a six-year-old Coleridge, an eight-year-old Goethe, or a ten-year-old Berkeley? And secondly, if the youthful intelligence does not sufficiently account for the later achievement, what other recorded traits of character may explain it? Do great energy and passionate ardor compensate for less intellectual power? Are any two of these three, health, interest, and ability, equal to any other two, as Galton has asserted, in making a mark that the world can and must see and recognize? And, if in terms of a test scale the "brightness" indicated by the recorded behavior of a Bryon or a Davy is just equal to that registered in the childhood activity of a Mozart or a Schleiermacher, can we read from the same records why one became a poet, another a scientist, another a musician, another a religious writer? Are there *characteristics of genius*—traits that mark all of those who will one day attain eminence? And if there are, to what extent is *intelligence* one of them?"

Subjects were chosen from Cattell's list of 1000 men of unquestioned eminence, the selection being based on degree of eminence together with the adequacy of available historical records. These subjects were then rated on intelligence. All records of childhood performances were carefully examined and compared with the findings of modern intelligence tests as to the performances typical of children of different mental ages. Ratings of three or more expert judges were combined in every case. The average rating for the group falls between 135 and 145 IQ, but since the effect of inadequate records tends to lower the estimated ratings, it is suggested that the true average for the group should be considered as not lower than 155 to 165 IQ.

Of course, IQ's assigned to men long since dead cannot compare in accuracy with those obtained from mental tests of living children! This the author frankly recognizes and acknowledges. All that is claimed for the scores is that they register "the *average IQ rating* of *all individuals* who do the things that are *recorded* of the given subject *at a particular age*." The evaluations have been made with painstaking thoroughness, and are as near to the truth as any estimates that could in the nature of the circumstances be arrived at. In every case the reliability of the estimate in relation to the amount of information available is indicated.

The data are presented from numerous angles. Cases are grouped by nationality, by field of achievement, by estimated IQ, degree of eminence, etc., and findings summarized. Environmental factors are examined and character ratings presented. It is concluded that youths who achieve eminence have, in general, superior heredity and home advantages, display childhood behavior and achivement characteristic

of high IQ, and are characterized by persistence of motive and effort, confidence in their abilities, and great force of character—findings quite in keeping with those derived from volume I of this series.

The second part of the volume is made up of greatly condensed case studies, arranged in order of estimated IQ. Data are presented regarding family standing, development to age 17, including interests, education, reading, productions or achievement, and other evidences of precocity. Development from 17 to 26 is separately treated. An appendix gives a single sample case study in full, and a second appendix presents excerpts, selected and arranged by Dr. Terman, from the early writings of young geniuses.

These two volumes taken together comprise a veritable mine of information in regard to the basic characteristics of the genius and the potential genius. The intrinsic value of the information presented is enormous; these volumes are an invaluable contribution to the study of human mind and character. It is furthermore to be hoped and expected that they will furnish both information and stimulation to educators toward devising better methods of training for the gifted, and will be productive of enhanced interest among psychologists in general in the investigation of the important problems of mental superiority.

JESSIE C. FENTON,
Ohio University.

HARRY DEXTER KITSON. *Scientific Advertising.* New York: Codex Book Company, Inc., 1926. 73 pp.

In this little book of only seventy-three pages Professor Kitson renders a twofold service to the science of advertising. First, and more important, he shows the value of the historical method in this field of study. It is his conviction that this method may often be substituted for the more expensive "investigation of returns" and its substitute, the laboratory method, for the purpose of ascertaining the elements most likely to be successful in advertisements. This conviction is based upon an assumption, probably not unwarranted, that modern advertising practices are the products of unconscious evolution. Those advertising practices which had psychological elements of strength and fitness sufficient to make them successful have persisted, while unsuccessful types have been eliminated, either by the substitution of better methods or by the unsuccess of their users. It will thus be seen that if successful advertising practices represent, as the author states, a sort of economic survival of the fittest, the historical study of these practices should show which elements are best. Thus if the assumption is granted the historical method is justified.

The author's second contribution, though not unimportant, is merely a by-product of the first. Setting out to demonstrate the value of the

historical method, he applies it to a number of type problems. His results shed considerable light upon these problems. His study of height of headlines in full page advertisements may be used as an example. Measuring the height of such headlines in Collier's Weekly for the years 1911–1920 inclusive, he substantiates Starch's statement made in 1910 that "the maximum size of display type for a magazine page has now been reached." In other applications of the method conclusions which are more than merely corroborative of previous studies are reached. History of full page advertisements, size of type, use of border and illustration, position, the package, and the history of the "service idea" in advertising with a few other problems make up the subject matter of the book.

Consisting as it does of a number of clear-cut problems and abounding in tables and graphs the book should be useful to students and teachers of advertising as a guide to scientific procedure. Needless to say, if so used, it should be supplemented by other types of research problems such as those involving the laboratory method. Both in its method and its conclusions it should also be of interest to those directly engaged in advertising.

ERNEST RICHMOND BURTON. *Employee Representation*. Baltimore. The Williams & Wilkins Company, 1926. 283 pp. $3.00.

Anyone wishing to gain a thorough understanding of employee representation can not do better than to read this book. Its five divisions are orientation, needs and purposes, organization, administration, and results. Each subject is discussed in detail, from many angles, and apparently without bias. Under the heading "Trade Union Criticisms of Employee Representation" it is stated that letters addressed to labor union officials by the author asking for specific instances of discrimination against employee's representatives elicited no evidence of this character. A search of trade union periodicals also failed to give evidence of such discrimination and hence intimidation. The author points out, however, certain factors not apparent from such inquiries as were made which might make for intimidation of representatives. While he does not in the main accept this particular criticism of employee representation, he does state both sides even when his own investigations show no support for the criticism. A less careful writer would have merely dismissed the criticism on the ground that he found no evidence supporting it.

The conception of employee representation as a mere device to strengthen the employer's control over his workers is emphatically rejected. Equally unacceptable to the writer is the viewpoint that makes it a means for strengthening employees' position in their traditional conflict with their employer. That both of these purposes exist

in many quarters is not to be denied, but so long as they do they only serve to perpetuate the chasm between workers and managers. Employee representation is rather to be thought of as an integrating force, the main objective of which is to bridge this chasm by making more effective the labors of both to the mutual advantage of management, workers and public.

The book is primarily concerned not with theories and Utopian schemes but with actual plans that have been or are being tried out. Principles are derived from the success or failure of various attempts at this particular phase of management. The author thus is thrown for his material largely upon the published reports of industrial concerns and students of industry. Footnote references to these are very complete. Investigations carried on, the writer states in his preface, largely through correspondence, furnish the original data of the study.

The style of the book does not make for particularly easy reading, and anyone not genuinely interested in the subject will probably never finish reading it. To those whose interest is sufficient to carry them through it will prove to be a veritable mine of useful information. Nor is it merely informative, as the author has a definite viewpoint which pervades his book with an enlightening interpretation and a hopeful philosophy.

LALLA H. PICKETT AND DURALDE BOREN. *Early Childhood Education.* World Book Company, 1925. Pp. vii + 220.

As a result of their experience in the field about which they write, the authors set forth the current doctrines and practices in kindergarten and first grade teaching. In the first chapter "Underlying Principles," the play life of the child as a point of departure in teaching social habits and the tool subjects is emphasized. The teacher's place is that of guide, not telling the child what he needs to know but helping him to discover these things for himself. The contributions and shortcomings of Froebel and Montessori are mentioned and it is shown how the practice of today supplements their methods. Curricula, projects, materials and typical activities are among the subjects discussed in later chapters. Many actual doings and sayings of pupils are given to illustrate the points made, and there are numerous photographs representing the play and play-work of kindergarten and first grade children.

While the reviewer does not wish to offer any adverse criticisms it does seem that one or two assumptions which the authors seem to take for granted should be questioned. The following statement is a case in point. "Then, in a serious way, one small girl sat down in the bedroom to rock the baby while two other girls sat in the living room to be the ladies of the house. This was soul-absorbing, whole-hearted living." Very charming, no doubt, but one wonders just what the educative value

of this sort of play may be. Should not a distinction be made between mere make-believe and the manipulative or constructive activities such as building, drawing, playing store and the like in which real things are handled and real ideas brought into use? In view of the current doctrines in certain quarters about the need of facing reality it would seem that such a question is not out of place. It should be said in justice to the authors, however, that the above quotation does not represent the whole viewpoint of the book, and that many, perhaps most, of the play activities described and suggested are of a wholesomely objective type.

Again, while the importance of initiative on the part of the children cannot be over-emphasized, it might be asked if the insistence that the conditions be set so that they shall decide practically all matters of conduct and discover for themselves the things they need to know, may not be an impractical ideal. Despite the claims of the teachers' colleges and the writers of methods books, are we able to train teachers to do this with any considerable degree of success? And even when, if ever, a sufficiently standardized procedure of inducing decisions and discoveries is worked out that ordinary teachers can use it without an unreasonable amount of maneuvering, may not the conditions they set up as often as not deceive them into accepting seeming decisions and discoveries for the real thing?

The book is, on the whole, well written and contains many valuable suggestions. It should be especially helpful to inexperienced teachers and to others if there are such who realize that their methods and viewpoints are in need of being brought up to date.

AMOS C. ANDERSON,
Ohio University.

NEW BOOKS AND PAMPHLETS RECEIVED*

Books and pamphlets for review should be sent to James P. Porter, Department of Psychology, Ohio University, Athens, Ohio.

An Analysis of Over Three Million Inquiries Received by 98 Firms from 2339 Magazine Advertisements. DANIEL STARCH. 42 pp.

Annual Report of the American Telephone & Telegraph Co. for the Year 1926. 195 Broadway, New York City.

Business Personality and Its Development. NEWMAN L. HOOPINGARNER. A. W. Shaw Company, New York City.

Criminal Intelligence. CARL MURCHISON. Clark University, Worcester, Mass. 291 pp.

Games and Sports in British Schools and Universities. HOWARD J. SAVAGE. The Merrymount Press, Boston.

Psychological and Educational Survey of 1916 Prisoners in the Western Penitentiary of Pennsylvania. WILLIAM T. ROOT. Board of Trustees, Western Penitentiary. 246 pp.

Psychological Study of Cancer. ELIDA EVANS. Dodd, Mead & Co.

Psychology of Elementary School Subjects. HOMER B. REED. Ginn & Co. 481 pp.

Religious Education Survey Schedules, Vol. III. WALTER S. ATHEARN. George H. Doran Company, New York City.

Reluctantly Told. JANE HILLYER. Macmillan Company, 205 pp.

Selling at Retail. V. H. PELZ. McGraw-Hill Company. 327 pp.

Social Psychology Interpreted. JESSE WILLIAM SPROWLS. The Williams & Wilkins Company, Baltimore. 268 pp.

The Springs of Human Action. MEHRAN K. THOMSON. D. Appleton Company. *$3.00.* 501 pp.

Studies in Vocational Information. WILLIAM G. BATE AND ELIZA ANN WILSON. Longmans, Green & Company. 168 pp.

The Tired Child. MAX SEHAM AND GRETE SEHAM. J. B. Lippincott Co., Philadelphia.

PUBLICATIONS ISSUED BY THE BUREAU OF PUBLICATIONS, COLUMBIA UNIVERSITY, NEW YORK

An Experimental Study of Comprehension in Reading. ROBERT P. CARROLL.

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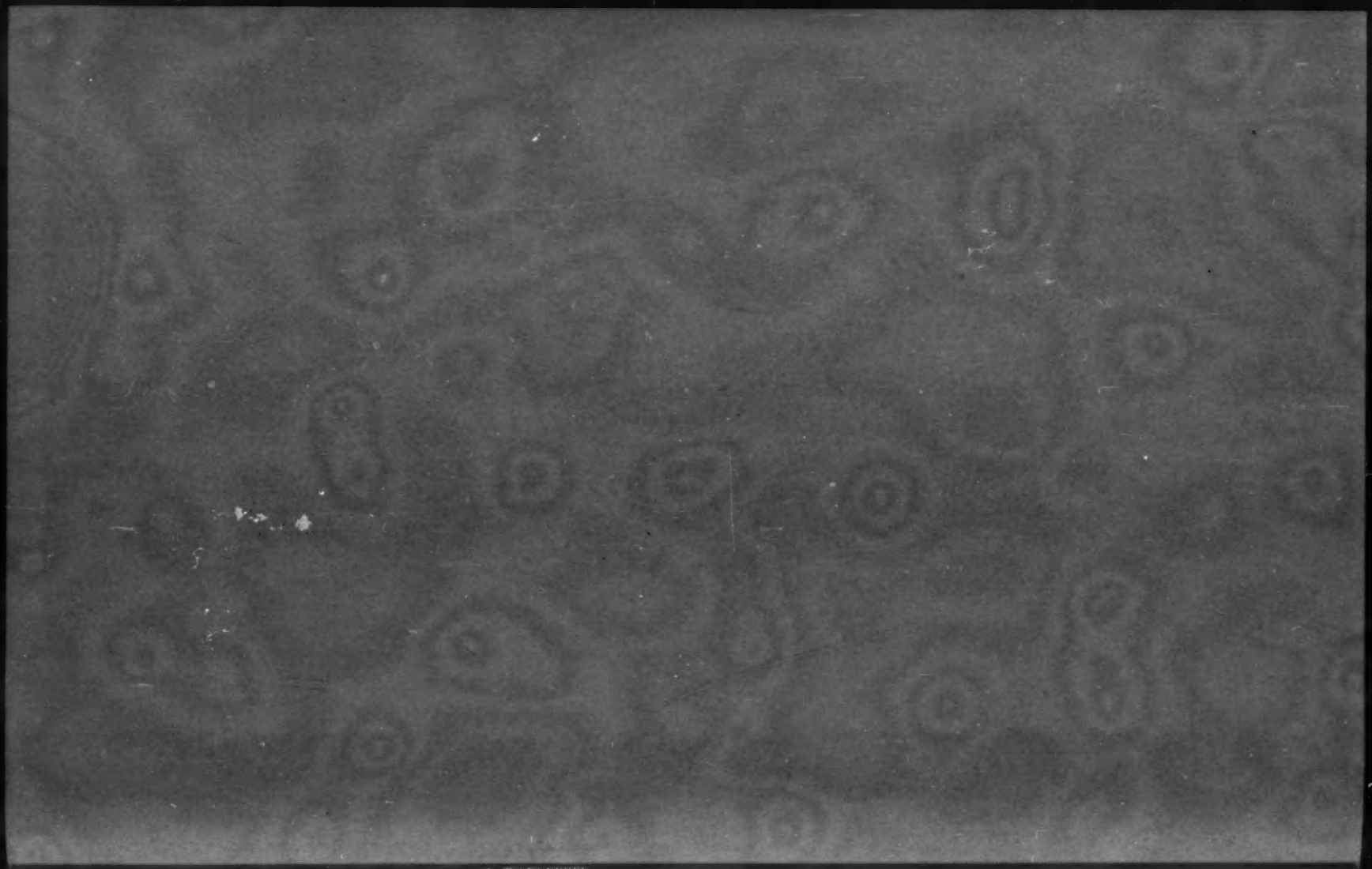
* Mention here does not preclude further comment.

A Detailed Analysis of Achievement in the High School. CECILE WHITE.
Part-Time Types of Elementary Schools in New York City. FRANK M. QUANCE.
The Problem of Teaching High School Pupils How to Study. JOSEPH S. BUTTERWECK.
The Small High School. JOHN RUFI.
A Study of International Attitudes of High School Students. GEORGE BRADFORD NEUMANN.
Subject Matter in Health Education. RUTH STRANG.



Directory of American Psychological Periodicals

American Journal of Psychology—Ithaca, N. Y.: Morrill Hall.
Subscription $6.50. 600 pages annually. Edited by M. F. Washburn, K. M. Dallenbach, M. Bentley, E. G. Boring. Quarterly. General and experimental psychology. Founded 1887.

The Pedagogical Seminary and Journal of Genetic Psychology—Worcester, Mass.: Clark University. Subscription $7. 700 pages annually. Edited by Carl Murchison and an international co-operating board. Quarterly. Child behavior, differential and genetic psychology. Founded 1891.

Psychological Review—Princeton, N. J.: Psychological Review Company.
Subscription $4.25. 480 pages annually.
Bi-monthly. General. Founded 1894. Edited by John B. Watson.

Psychological Bulletin—Princeton, N. J.: Psychological Review Company.
Subscription $5. 720 pages annually. Psychological literature.
Monthly. Founded 1904. Edited by Samuel W. Fernberger.

Psychological Monographs—Princeton, N. J.: Psychological Review Company.
Subscription $5.50 per vol. 500 pp. Founded 1895. Ed. by Shepherd I. Franz.
Published without fixed dates, each issue one or more researches.

Psychological Index—Princeton, N. J.: Psychological Review Company.
Subscription $1.50. 200 pp. Founded 1895. Edited by Walter S. Hunter.
An annual bibliography of psychological literature.

Journal of Philosophy—New York; 515 W. 116th St.
Subscription $4. 728 pages per volume. Founded 1904.
Bi-weekly. Edited by F. J. E. Woodbridge and Wendell T. Bush.

Archives of Psychology—Sub-Station 84, N. Y.: Archives of Psychology.
Subscription $5. 500 pp. ann. Founded 1906. Ed. by R. S. Woodworth.
Published without fixed dates, each number a single experimental study.

Journal of Abnormal Psychology and Social Psychology—Albany, N. Y.
Subscription $5. Boyd Printing and Publishing Co. Edited by Morton Prince in co-operation with Floyd H. Allport.
Quarterly. 432 pages annually. Founded 1906. Abnormal and Social.

Psychological Clinic—Philadelphia: Psychological Clinic Press.
Subscription $2.50. 288 pages. Ed. by Lightner Witmer. Founded 1907.
Without fixed dates (9 numbers). Orthogenics, psychology, hygiene.

Training School Bulletin—Vineland, N. J.: The Training School.
Subscription $1. 160 pp. ann. Ed. by E. R. Johnstone. Founded 1904.
Monthly (10 numbers). Psychology and training of defectives.

Comparative Psychology Monographs—Baltimore: Williams & Wilkins Co.
Subscription $5. 500 pages per volume. Edited by W. S. Hunter.
Published without fixed dates, each number a single research.

Psychoanalytic Review—Washington, D. C.: 3617 10th St., N. W.
Subscription $6. 500 pages annually. Psychoanalysis.
Quarterly. Founded 1913. Ed. by W. A. White and S. E. Jelliffe.

Journal of Experimental Psychology—Princeton, N. J.
Psychological Review Company. 480 pages annually. Experimental.
Subscription $4.25. Founded 1916. Bi-monthly. Ed. by Madison Bentley.

Journal of Applied Psychology—Baltimore: Williams & Wilkins Co.
Subscription $5. 400 pages annually. Founded 1917.
Quarterly. Edited by James P. Porter and William F. Book.

Journal of Comparative Psychology—Baltimore: Williams & Wilkins Co.
Subscription $5. 500 pages annually. Founded 1921.
Bi-monthly. Edited by Knight Dunlap and Robert M. Yerkes.

Journal of Personnel Research—Baltimore: Williams & Wilkins Co.
Subscription $5.00. 500 pages approximately. Edited by Walter V. Bingham, Lewis L. Thurstone, and Clarence S. Yoakum. Monthly.

Genetic Psychology Monographs—Worcester, Mass.: Clark University.
Subscription $7. 600 pages annually. Edited by Carl Murchison and an international cooperating board.
Bi-monthly from January, 1926. Each number one complete research. Child behavior, differential and genetic psychology. Founded 1925.

Psychological Abstracts—Princeton, N. J.
Subscription $6.00. 500 pages ann. Edited by W. S. Hunter. Monthly.
Abstracts of psychological literature. Founded 1927.